

An Exploration of the Suitability of Pharmacy Education in Saudi Arabia to Prepare Graduates to Meet Healthcare Needs: a Mixed-Methods Study

Thesis submitted to the University of Nottingham for the degree of Doctor of Philosophy

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Abstract

The key role of pharmacists within the health system, particularly in optimising safe, responsible and effective use of medicines, underpins the demand for a highly skilled and competent workforce. Therefore, developing the capacity of pharmacists to attain and maintain essential competencies relevant to the population's health needs is required to ensure a high standard of patient care, thereby helping to improve patient and population health. In Saudi Arabia, little evidence exists regarding the assessment of national educational programmes' structure and outcomes. Moreover, no national competency framework exists for pharmacists in any sector or stage of practice. In the absence of such core quality elements to inform pharmacy education assessment and development, the extent to which pharmacy schools in Saudi Arabia prepare competent pharmacists to address societal needs from pharmacy services is unclear. Therefore, this study aimed to explore the extent to which pharmacy education can prepare competent pharmacists to address the healthcare needs for pharmacy practice in Saudi Arabia.

An exploratory sequential mixed methods research design was used to address the aim of this study in three phases: individual interviews and focus groups were employed with a purposively selected sample of pharmacy policy makers, pharmacists and the public to explore societal healthcare needs and the roles required of pharmacists to meet those needs; a national online survey of pharmacists and an online nominal group consensus method of pharmacy experts were used to identify competencies considered essential to develop a profession-wide national foundation level competency framework; and a case study in which curriculum mapping of two purposively selected Doctor of Pharmacy (PharmD) curricula was used to assess the extent to which the current pharmacy programme in Saudi Arabia meets the identified competencies of the developed national competency framework.

Based on qualitative and quantitative analyses of societal healthcare needs, pharmacists' roles, core competencies and curricular contents within the local context of Saudi Arabia, findings showed that there is a mismatch between initial education and real practice needs and expectations. While the country's current needs from pharmacists are to optimise health system capacity and increase access to primary care services and medicines expertise in community pharmacies, the study indicated local education is product-oriented with a focus of curricular content and experiential training opportunities in most schools on preparing future pharmacists for hospital pharmacy practice. The study also identified several gaps between current initial education programmes and the competencies required to practise the expected roles, suggesting that current initial education might not prepare the students sufficiently to provide the full range of quality pharmaceutical services as per the country's pharmacy practice needs.

The study provided a new understanding of graduates' readiness to practise as per the country's pharmacy practice needs, the quality of educational programmes and pharmacists' professional development opportunities in Saudi Arabia. Findings maybe used to inform the development of competency-based education and maximise graduates' capacity to deliver and develop pharmaceutical services effectively to best meet societal healthcare needs in Saudi Arabia.

Publications

Research articles

ALFAIFI, S., ARAKAWA, N. & BRIDGES, S. 2022. The relevance of the International Pharmaceutical Federation Global Competency Framework in developing a country-level competency framework for pharmacists: A cross-sectional study. *Exploratory Research in Clinical and Social Pharmacy*, 5, p.100095.

ALFAIFI, S., BRIDGES, S. & ARAKAWA, N. 2022. Developing pharmacists' competencies in Saudi Arabia: A proposed national competency framework to support initial education and professional development. *Currents in Pharmacy Teaching and Learning*, 14, 1256-1268

Poster abstracts

Salihah Alfaifi, Stephanie Bridges, Naoko Arakawa. Pharmacy stakeholders and general public perceptions of local health needs: an exploratory approach to develop community pharmacy workforce in Saudi Arabia. 2021 SIPHA- Saudi International Pharmaceutical Sciences Meeting and Workshops Annual meeting (online). 3-minute online presentation

Salihah Alfaifi, Stephanie Bridges, Naoko Arakawa. Pharmacy stakeholders' and general public perceptions of local health needs: an exploratory approach to develop community pharmacy workforce in Saudi Arabia. 2021 AHPGR- The Allied Health Professional Postgraduate Research Conference (Online). 1-minute online presentation.

Salihah Alfaifi, Naoko Arakawa, Stephanie Bridges. The applicability of the International Pharmaceutical Federation Global Competency Framework (GbCF) in Saudi Arabia: A cross-sectional national survey. 2021 FIP - Pharmacy Practice Research Virtual Summer Meeting (online). 3-minute online presentation.

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List of abbreviations

AACP The American Association of Colleges of Pharmacy

ACPE Accreditation Council for Pharmaceutical Education

AHPGS The German Accreditation Agency in Health and Social Sciences

BPharm Bachelor's degree in Pharmacy

CAPE Centre for the Advancement of Pharmacy Education

CBET Competency-Based Education and Training

CCAPP The Canadian Council for Accreditation of Pharmacy Programmes

CE Continuing Education

COVID-19 Coronavirus disease 2019

CPD Continuing Professional Development

DPC Direct patient care

EMR Eastern Mediterranean Region

FIP The International Pharmaceutical Federation

GbCF The Global Competency Framework

GCC Gulf Corporative Council countries

GMP Good Manufacturing Practice

IQR interquartile range

KSU King Saud University

MOH Saudi Ministry of Health

NCAAA The National Commission for Academic Accreditation and Assessment

NCDs Non-communicable chronic diseases

NDPC Non-direct patient care

NGT Nominal Group Technique

OBE Outcome-based education

OM Organisation and Management competency cluster

OSCEs Objective Structure Clinical Exams

OSOP One Sheet of Paper

PC Pharmaceutical care competency cluster

PharmD Doctor of Pharmacy

PHARMINE PHARMacy Education IN Europe

PHCCs Primary Healthcare Centres

PP Professional/Personal competency cluster

PPH Pharmaceutical Public Health competency cluster

PPRS Personalised Panellist Rating Sheet

SCFHS Saudi Commission for Health Specialities

SCPP Saudi Council of Pharmacy Profession

SFDA Saudi Food and Drug Administration

SPLE Saudi Pharmacist Licensure Examination

SPS Saudi Pharmaceutical Society

SPSS Statistical Package for the Social Science Software

UNESCO The United Nations Educational Scientific and Cultural Organization

WHO The World Health Organization

Chapter 1: Thesis introduction

1.1 Introduction

Pharmacists are a key component of the healthcare workforce. Their key role within the health system, particularly in optimising safe, responsible and effective use of medicines, underpins the high demand for an available, responsive, productive and competent workforce. Therefore, developing the capacity of pharmacists to attain and maintain essential competencies relevant to the population's health needs is required to ensure a high standard of patient care, thereby helping to improve patient and population health.

The purpose of this research project was to explore the extent to which pharmacy education can prepare competent pharmacists to address the healthcare needs for pharmacy practice in Saudi Arabia. This will provide an insight into the status of pharmacy education in Saudi Arabia and explore whether core quality elements required to address societal healthcare needs are involved in current educational programmes.

1.2 Structure of the thesis

This thesis comprises seven chapters, as shown in Figure 1.1 below.

This chapter, **Chapter 1**, briefly describes the need for this research and the thesis structure.

Chapter 2 presents a review of literature relevant to the theoretical framework of "needs-based education" and "competency-based education" as well as the research context of "pharmacy education and practice in Saudi Arabia".

Chapter 3 describes the methodology and methods adopted for this study, which was an exploratory sequential mixed methods research design involving semi-structured individual interviews and focus groups of pharmacy stakeholders in phase 1, a cross-sectional survey of pharmacists in phase 2a, a nominal group

technique of pharmacy experts in phase 2b, and curriculum mapping of two PharmD programmes in phase 3.

Chapter 4 presents the phase 1 findings of the healthcare needs assessment to explore the unmet healthcare needs of the population and the roles required by pharmacists to address these needs. This phase of the study identified perceived needs of the health system and pharmacist services from the perspectives of policymakers, pharmacists and the general public in the Saudi context. It also provided insights into the status of current initial pharmacy education and graduates' readiness to practise based on what the respondents perceived is currently needed in the labour market. It additionally suggested approaches to upgrade the pharmacy education model and curricula to be needs-based to fulfil the government plans and population needs of pharmacists.

Chapter 5 presents the phase 2 findings from two consecutive studies to determine the competencies required for effective professional performance within the local pharmacy context in Saudi Arabia. In consultation with local pharmacy practitioners and pharmacy experts, phases 2a and 2b assessed the relevance of the FIP GbCF v1 to identify the required competencies and then adapted the FIP GbCF v2 to develop the first national competency framework for foundation-level pharmacists in Saudi Arabia. The consultation with practising pharmacists (phase 2a) and pharmacy experts (phase 2b) enabled the collection of more views about different areas of practice for a greater understanding of the relevance and appropriateness of the FIP GbCF competencies to current Saudi pharmacy practice. This helped to develop a complementary picture, identify trends, and validate results about services and competencies required for effective professional performance thereby informing the development of a unique framework specific to the needs of pharmacy practice in the Saudi context.

Chapter 6 presents the phase 3 findings of the case study to assess the extent to which current pharmacy curricula meet the proposed national competency framework. This phase of the study used a curriculum mapping approach to provide

insight into the status of pharmacy education by evaluating the extent to which the curricular content of two educational programmes included the competencies identified previously in phase 2 as required for effective professional performance. This provided clear insights into the strengths and weaknesses of the sampled curricula, consequently offering opportunities to improve the quality of education in Saudi Arabia.

Chapter 7 discusses and integrates the key findings obtained from the three study phases, relating the study findings to the wider literature and discussing their implications for pharmacy education, practice, and policy in Saudi Arabia.

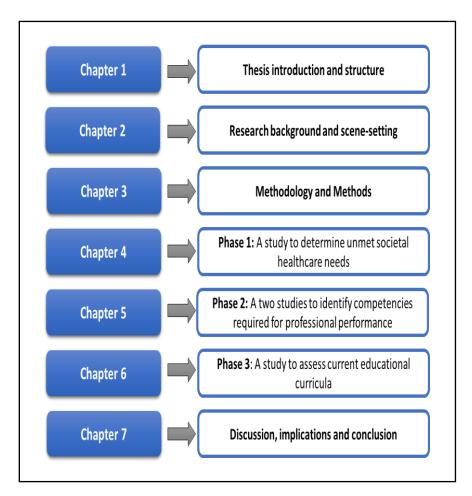


Figure 1.1: Structure of the thesis

Chapter 2: Research background and scene-setting

2.1 Introduction

This chapter presents a review of relevant literature regarding the status of pharmacy education and specifically in Saudi Arabia and the extent to which it prepares competent pharmacists to address the country's healthcare needs. The chapter begins with a description of the theoretical research framework detailing the current trends of global health professional education, including pharmacy education, focussing on needs-based and competency-based education models for contemporary pharmacy education. Then, it provides a detailed review of the literature related to the research context of pharmacy education and practice status in Saudi Arabia. The identified gaps in the literature, research questions, research aim and objectives are also provided.

2.2 Education of health professionals

Health professionals are at the core of the health system (Anand and Bärnighausen, 2012). Their key role in delivering health services underpins the high demand for an available, responsive, productive and competent workforce (WHO, 2007). Therefore, efforts are needed not only to ensure an adequate health workforce but to review and, as necessary, transform health professionals' education to attain the right mix of competencies responsive to the needs and expectations of the population they care for (WHO, 2013b).

Currently, new health challenges loom. Demographic and epidemiological health transitions, technology and therapeutic advances as well as behavioural and environmental risks add more challenges and complexity to health systems, as well as demands and expectations from health professionals. To optimise health outcomes, the Lancet commissions (2010) recommended the reform of health professionals education into to a competency-based and outcomes evaluation. The commission's recommendations addresses the connection between health systems and education and recognises the population not only recipients of services but also as actual producers as they generate the needs and demands of both systems.

These reforms aim to produce a workforce equipped with the required competencies to address the population's needs in the context of practice settings and avoid imbalances between the educational system and health system requirements (Frenk et al., 2010).

2.3 Education of pharmacists

2.3.1 Role of pharmacists within health systems

Pharmacists are the most accessible healthcare professionals in many countries (Bates et al., 2016). They have a key role in healthcare services delivery represented in optimising safe, responsible and effective use of medicines, as well as providing preventive and public health services being the main access to primary healthcare (International Pharmaceutical Federation, 2012a; Udoh et al., 2020). Evidence shows that the services provided by pharmacists can positively influence quality of delivery of healthcare, as well as positively affect health outcomes (Giberson et al., 2011b). Therefore, developing the capacity of pharmacists is a key strategy to strengthen the performance of health systems. This underpins the need for pharmacists to attain and maintain essential competencies relevant to the population's health needs to ensure a high standard of patient care, thereby helping to improve patient and population health (International Pharmaceutical Federation, 2012a; International Pharmaceutical Federation, 2012b).

2.3.2 The evolution of pharmacy education towards pharmaceutical care practice

Over the past few decades, pharmacy practice has changed from product-oriented (concerned with medicines compounding, manufacturing and dispensing) to patient-oriented (concerned with direct patient care activities and patient education). These changes in practice have resulted primarily from significant reforms in health systems, changes in population demographics, drug discovery, technology advancements as well as economic and political forces modulating health systems in many countries (Awaisu and Mottram, 2018). To assume the new role of pharmaceutical care practice, pharmacists need to perform many new functions, including patient assessment, care planning, follow-up evaluation and

documentation. These changes in pharmacy practice dictates the need for pharmacy curricula to shift its focus from the traditional sciences-based approach, which focuses on gaining knowledge and expertise of pharmaceutical chemistry, pharmaceutics, pharmacognosy, pharmacology and pharmacy administration, into a clinical-based approach, which focuses on knowing and applying principles surrounding activities to manage the drug therapy for achieving definite outcomes which will enhance patients' quality of life (Wiedenmayer et al., 2006; Awaisu and Mottram, 2018). As pharmaceutical care has become the primary goal of the profession, the linkage between the new roles and the curricula must ensure that the educational outcomes of pharmacy curricula are identical or directly related to the functions and responsibilities of practitioners (Newton, 1991; Winslade et al 1996).

Around the world, however, the change toward the patient-centred practice in the pharmacy curricula has occurred in varying degrees and at different paces resulting in variabilities in pharmacy curricula in different countries (Awaisu and Mottram, 2018; Awaisu and Pawluk, 2015). In developed countries such as in North America and Europe, the curricular change toward patient care is more evident than in developing countries where traditional curricula are still largely product-oriented (Awaisu and Mottram, 2018; Kheir et al., 2008; Bajis et al., 2016). In developed countries, the changes in education were necessary to accommodate significant changes in pharmacy practice (Awaisu and Mottram, 2018).

In 2008, the FIP in cooperation with the World Health Organisation (WHO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) developed its Global Pharmacy Education Action Plan 2008-2010 to support and strengthen local, national and regional efforts in pharmacy education development (Anderson et al., 2008; Anderson et al., 2009). It aimed to develop evidence-based frameworks to facilitate the development of pharmacy higher education capacity to prepare a competent pharmacy workforce that provides optimal pharmaceutical care services relevant to the need of their societies. The action plan comprised four main domains: pharmacy education vision, quality assurance, academic and

institution capacity and pharmaceutical services competency framework. The FIP-WHO-UNESCO taskforce believed that developing a shared vision for pharmacy education is important for building momentum and collective actions toward quality education. The taskforce recognised that the "one size fits all" educational model or system is neither desirable nor feasible. Thus, the action plan called for the need to develop education based on the local needs of countries through applying the principles of a needs-based professional educational model (Anderson et al., 2008; Anderson et al., 2014; Awaisu and Mottram, 2018; Anderson et al., 2009).

2.4 Needs-based education model

Needs-based education is an educational model that aims to provide an evidence-based approach to inform the global shift from a static rigid traditional education to modern responsive education to the changing societal healthcare needs of the society and advances in healthcare (International Pharmaceutical Federation, 2017; Anderson et al., 2010; Anderson and Futter, 2009; International Pharmaceutical Federation, 2014). This model advocates for the development of an optimal educational system through a cycle that ensures that pharmacy education is locally determined, socially accountable, globally connected and quality assured (International Pharmaceutical Federation, 2017). In a specific context, this is achieved by applying the following four steps (Figure 2.1) (International Pharmaceutical Federation, 2017; Anderson et al., 2014):

- 1. Determining local healthcare needs
- 2. Defining services required to meet those needs
- 3. Identifying competencies acquired by practitioners to fulfil these services
- 4. Developing an appropriate educational programme to meet local and national needs.

The stages of this model will be discussed in more detail in the following sections.

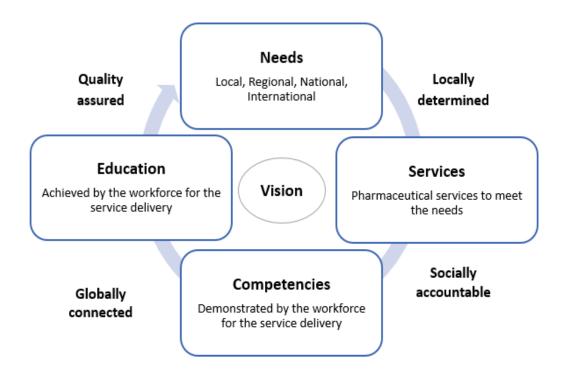


Figure 2.1: The FIP needs based education model (International Pharmaceutical Federation, 2017)

2.4.1 Determining local needs and services required to meet those needs

Identifying societal healthcare needs that can benefit from wider healthcare system changes or pharmacists' care should be determined before the development of any health intervention or patient care services (Wright et al., 1998; International Pharmaceutical Federation, 2014; Garcia-Cardenas et al., 2020). If not, the sustainability of the developed health services might be compromised because they might be unable to respond to current or future needs (Garcia-Cardenas et al., 2020). To address the unmet needs of a population, a systemic method must be undertaken first to inform any future plans or changes (Wright et al., 1998).

2.4.1.1 Health needs assessment

Health needs assessment is a systemic approach to analysing the health needs and concerns of a specific community, leading to agreed priorities and resource allocation that will enhance health and minimise inequalities (Quigley and HDA, 2005). The term healthcare needs specifically describes the needs of a population

for the provision of particular health services and those areas that can benefit from healthcare, such as health education, disease prevention, diagnosis and treatment. Health needs assessment involves different approaches to balance clinical, ethical and economic considerations of needs to determine the most effective use of resources; that is, what can be done, what should be done and what can be afforded (Stevens and Gillam, 1998). Health needs assessment provides individual institutions and health practitioners with the opportunity to assess the health needs of their patients to highlight areas of unmet needs, set priorities to improve the local population's health, set objectives to meet the need and influence policy, research, collaboration as well as decide the optimal utilisation of current resources efficiently and effectively (Wright et al., 1998).

2.4.2 Identifying the required competencies to fulfil the required services

To meet societal healthcare needs effectively, pharmacists must master a comprehensive set of professional competencies to commit and deliver the range of current and new pharmaceutical services, as appropriate to their population needs (Katoue and Schwinghammer, 2018). Therefore, defined competencies for pharmacy graduates are required to direct the evolving educational curricula to meet the changing societal healthcare needs (Awaisu and Mottram, 2018).

2.4.2.1 Defining competency

The term competency is commonly used in various fields and its definition differs according to the context, the discipline it is used in as well as the different theoretical conceptualisations (Moore et al., 2002). In the literature, competency refers to either of two meanings: inputs or underlying attributes required for competent performance, and outputs, or results of the training that is competent performance (Sanghi, 2016). Unsurprisingly, there is no consensus definition of competency.

Definitions in the field of health professional education are no clearer, especially in the presence of other terms that can be used interchangeably with competency without clarification, such as performance and clinical proficiency (Epstein and Hundert, 2002; Albanese et al., 2008). Due to the existing variation in the contextual factors and philosophical approaches related to competency as a concept, it has been described recently as "a complex and ill-defined concept" (Australian Medical Council, 2010).

Arguing that the lack of a consensus on the definition of competency and its related terms limits the advancement of health professions education and development of workforce policy programmes, Frank and colleagues (2010) have proposed definitions of competency and its related concepts. These definitions were built on a systemic review of published definitions as a means to examine current conceptual issues and debates around competency-based education and training (CBET) and proposed consensus definitions useful for global educators (Table 2.1).

Table 2.1: Definitions of concepts related to competency-based education by the international competency-based medical education collaborators (Frank et al., 2010).

Concept	Definition
Competence	A set of abilities across multiple aspects or domains of
	health professional performance in a certain context.
	Competence statements involve descriptive qualifiers to
	define context, stage of training and relevant abilities.
	Competence is dynamic and multidimensional, changes
	with time, experience and setting
Competency	An observable ability of a health professional that
	integrates multiple components of knowledge, skills,
	values and attitudes. As they are observable,
	competencies can be measured and assessed to ensure
	their acquisition
Competency based education	An outcome-based educational approach to design,
	implement, assess and evaluate health professions
	educational programmes using competency as the
	organising unit
Competent	A healthcare professional who possesses the abilities
	required in all competency domains to practice in a
	certain context at a defined stage of education or
	practice
Dyscompetent	A healthcare professional who possesses fewer abilities
	in one or more domains of competency in a certain
	context at a defined stage of education or practice
Incompetent	A healthcare professional who lacks the abilities
	required in all competency domains in a certain context
	at a defined stage of education or practice

2.4.2.2 Components of competency

In the literature on health professions education, behaviours of a given competency are built on the components of knowledge, skills, attitudes and personal abilities based on individual values and judgement (Albanese et al., 2008; Frank et al., 2010; Fernandez et al., 2012; Spady, 1977; Grussing, 1984; Carraccio et al., 2002).

Knowledge is a social construct that results from the interaction between intelligence (which is the capacity to learn) and situation (which is the opportunity to learn) (Winterton et al., 2006). Knowledge involves concepts, theories that can be gained from formal learning as well as the implied knowledge that can be gained from informal learning such as practices or experiences from performing specific tasks.

Skill is a "well-organised and goal-directed behaviour that is acquired through practice and performed with an economy of effort" (Winterton et al., 2006). Skills typically involve both physical psychomotor abilities and mental cognitive abilities.

Attitudes are the intangible component of competency related to personal characteristics and values of individuals as manifested in their professional judgement in practice. As they are related the personal growth and experience in practice, Fernandez et al (2012) argued that attitudes cannot be taught formally in the curriculum, instead, they can be fostered by appropriate role models in practice settings. When insufficient information is available, attitude is the component that largely accounts for the individual ability to make decisions, manage ambiguous problems and tolerate uncertain conditions (Leung, 2002).

Abilities are the experienced or inherited attributes a person brings to perform required tasks in a specific practice domain. Generally, it is comprised of the abstract reasoning, memory and cognitive processes associated with problem-solving of novel questions (Fernandez et al., 2012).

2.4.2.3 Competency frameworks

Competency frameworks are supportive education and training tools that enable the progression and development of the practitioner toward effective performance (Bruno, 2011). The need for transparency in the training, development and accreditation of health practitioners has contributed to the increasing use (Bates and Bruno, 2008).

Competency frameworks typically involve a compilation of competencies required for valuable and capable performance (Whiddett and Hollyforde, 2003). "Competency" pertains to a subset of outcomes, including knowledge, skills, attitudes and behaviours that relate to professional performance, affect the responsibilities or roles of individuals and undergo improvement and development through education, training and work experience (Albanese et al., 2008; Katoue and Schwinghammer, 2018). Each competency comprises a set of "behavioural" statements" that describe how a specific competency can be measured or observed in practice (Bruno, 2011). Closely related behaviours are collated into competencies and similar competencies are collated into competency clusters. A "competency cluster" therefore is defined as a compilation of closely related competencies within the framework (Bruno, 2011). "Competency frameworks" typically represent the complete set of clusters, competencies and associated behavioural statements required for effective performance in practice. Competency frameworks can be used to support a range of professional activities, including assisting individuals and managers to identify gaps between standards of practice and current knowledge, skills and activities, as well as specific learning and development needs, informing the licensure exam, facilitating continuing education (CE) and continuing professional development (CPD) activities, provide a framework to support local performance and appraisal procedures, measure fitness for practice (The Competency Development and Evaluation Group, 2007) and support pharmacists' professional development at entry-level, i.e., day one of registration, foundation level or advanced or specialised level practice (Nash et al., 2015; Katoue and Schwinghammer, 2018). In addition, they can be used to unify outcomes of initial education, accreditation criteria and inform the development of CBET curriculum.

An effective competency framework should be fit for purpose and meet the following quality criteria: relevant to all individuals affected by the framework, clear and easy to understand, elements should be of the same type, and have discrete elements (e.g. behavioural statements do not overlap), consider expected changes (i.e. versatility), fair to all affected individuals, and behaviours are necessary and appropriate (Bruno, 2011). The language used in the competency framework, whether the framework is generic or specific, must be relevant to all those using it. As behavioural statements are the building blocks, all aspects of the competency framework should be behavioural based (Whiddett and Hollyforde, 2003).

Competency frameworks differ from standards of practice which define what the licensed practitioner should be able to do in daily practice to ensure minimum practice quality and patient safety (Udoh, 2016). Competency frameworks are designed to support individual performance and enhance excellence in practice, not to compensate for poor practice (Bruno, 2011). Hence, behaviours within a competency framework support effective performance when a practitioner is working under appropriate procedures and safety standards (Whiddett and Hollyforde, 2003). Evidence shows that the use of competency frameworks alongside standards of practice can support pharmacists' development, contribute to effective and sustainable performance and assure practice consistency (Coombes et al., 2010; Rutter et al., 2012; Udoh et al., 2021; Udoh, 2016).

The current impetus for developing a pharmacy competency framework is led by professional organisations in several developed countries. In some countries, the development of competency was through wide consultation of pharmacists and other stakeholders while others adopted and adapted their own from an established framework after modifications to fit the local needs of pharmacy practice (Katoue and Schwinghammer, 2018).

In the United States, for example, the American Association of Colleges of Pharmacy (AACP) Centre for the Advancement of Pharmacy Education (CAPE) developed

educational outcomes to guide curriculum planning, delivery and assessment. The CAPE outcomes comprised four domains: foundational knowledge; essentials for practice and care; approaches to practice and care; personal and professional development. These outcomes were used in the accreditation standards of the Accreditation Council for Pharmacy Education (ACPE) 2016 for PharmD programmes (Accreditation Council for Pharmacy Education, 2015), as well as to inform the North American Pharmacists Licensure Examination blueprint about the competencies expected of entry-level pharmacists in the United States (National Association of Boards of Pharmacy, 2021).

In the United Kingdom, the Competency Development and Evaluation Group (CoDEG) (2007) developed a general level competency framework to support graduates from registration to general level practice. The framework comprised four clusters: personal attributes, delivery of patient care, management and organisation, and problem-solving. The CoDEG also developed an advanced and consultant-level competency framework which involved six clusters: expert professional practice; leadership; management; building working relationships; education, training and development; research and evaluation (The Competency Development and Evaluation Group, 2009). To support professional development across the pharmacy profession, the Royal Pharmaceutical Society of Great Britain developed several competency frameworks using an evidence-based and collaborative processes involving all UK major stakeholders, the general public and pharmacists (Royal Pharmaceutical Society, 2023). These frameworks include foundation pharmacy framework, advanced pharmacy framework, prescribers competency framework, designated prescribing practitioner competency framework and leadership development framework.

As a more overarching framework, to achieve a global harmonisation of competencies for the pharmacy profession, the FIP-WHO-UNESCO Taskforce developed the GbCF v1 to support pharmacists' career development worldwide (International Pharmaceutical Federation, 2012c). Its scope covers foundation level (or early career) pharmacists, i.e., beyond day one of registration, and up to one to

two years of practice, depending on the country's practice environment (International Pharmaceutical Federation, 2012c). The focus of the FIP on foundation-level competencies was due to the importance for pharmacists globally to demonstrate appropriate foundation practice competencies to progress to advanced or specialised practice (International Pharmaceutical Federation, 2012b; International Pharmaceutical Federation, 2015). The FIP GbCF v1 includes a set of competencies that can be used as a 'mapping tool' to develop country-specific frameworks according to the local needs of pharmacy practice. Since its development, it has been used successfully to develop country-specific frameworks for in-service pharmacists as well as pre-service education in several countries. In 2020, the FIP published a revised and updated second version of the framework (GbCF v2) that adds new competencies to reflect the evolving roles of pharmacists and technology and therapeutic advances (International Pharmaceutical Federation, 2020b). The FIP also developed other developmental frameworks such as Global Advanced Development (International Pharmaceutical Federation, 2020a), Global Humanitarian Competency (International Pharmaceutical Federation, 2021) the FIP Global Competency Framework for Educators & Trainers in Pharmacy (International Pharmaceutical Federation, 2022) to support the professional development of the advanced specialised practice of the pharmaceutical workforce worldwide.

Although all current existing pharmacy competency frameworks appear to have similar components as they generally address the same aspects of professional competence (Nash et al., 2015; Koster et al., 2017), their diversity illustrates there is no unified prescription for competency frameworks (Koster et al., 2017; Katoue and Schwinghammer, 2018). Therefore, if a nationally-developed competency framework covers all competencies essential to professional pharmacy practice within a country and is consistent internally, it can be used as a tool to guide education assessment, structuring and development (Koster et al., 2017). Importantly, competency frameworks should be reviewed and updated regularly by issuing organisations to include new practice competencies to keep pace with the evolving roles of pharmacists within healthcare (Katoue and Schwinghammer, 2018).

2.4.3 Developing educational programme to meet local and national needs

To make meaningful contribution to the country's healthcare system, pharmacy education must develop the capacity of pharmacists appropriately to reflect the evolving patient needs as well as technology trends and scientific advances (International Pharmaceutical Federation, 2014). This dictates the need to assure the quality of educational programmes, along with the institutional and academic infrastructure, to deliver a comprehensive quality model for CBET.

2.5 Competency-based education and training

The perceived need to prepare capable health professionals to meet the changing demands of healthcare systems has promoted the interest in CBET (Gruppen et al., 2012; Katoue and Schwinghammer, 2018). CBET is an outcome-based educational approach that uses competency as the organising unit for designing, implementing, assessing and evaluating an educational programme for healthcare professionals (Gruppen et al., 2012; Frank et al., 2010). Regardless of country or region, this educational model aims to instil the competencies required to provide care services that meet societal healthcare needs in the health graduates (Katoue and Schwinghammer, 2018). This model represents a shift from static, rigid, unresponsive traditional educational programmes to programmes responsive to the advances in the healthcare field as well as the changing needs of patients and populations (Katoue and Schwinghammer, 2018). Perhaps most important, it fosters the professional development of health practitioners at all learning stages, from undergraduate years throughout the practice years into advanced levels (Swing and Collaborators, 2010).

When compared with traditional knowledge-based education, CBET has four main characteristics (Frank et al., 2010; Gruppen et al., 2012): an emphasis on competencies, a focus on curricular outcomes, a promotion of learner-centeredness and a de-emphasis on time-based training. The CBET curriculum focuses on outcomes while instilling the core practice competencies in learners to meet the needs of those served by graduates. CBET also provides a more flexible timeframe for completion than the traditional strict time-based curriculum which is more

efficient and engaging for learners because they can progress at their own pace while building on previous competencies (Carraccio et al., 2002; Frank et al., 2010). The focus in CBET shifts from teaching to learning whereby the role of teachers in this approach changes from a source of knowledge and expertise to a learning coach and facilitator (Gruppen, 2015). This learner-centred approach fosters learners to take on the responsibility for personal learning and development by mapping a pathway from one milestone to another on the way towards achieving competence (Frank et al., 2010). A comparison of the elements of traditional knowledge-based education versus CBET is illustrated in Table 2.2.

Table 2.2: Comparison between traditional and competency-based educational programmes (Carraccio et al., 2002)

Variables	Traditional knowledge- based education	Competency-based education
Driving force for curriculum	Content- knowledge acquisition	Outcome- knowledge application
Driving force for process	Teacher	Learner
Path of learning	Hierarchical (teacher to learner)	Non-hierarchical (teacher and learner)
Assessment tool	Proxy-single subjective measure	Authentic-multiple objective measures
Timing of assessment	Summative	Summative and formative
Programme completion	Fixed time	Variable time

CBET is closely related to outcome-based education (OBE) and can be regarded as a type of OBE, which is an educational philosophy that focuses on the learners and the programme outcomes rather than the process and pathways to achieve them (Frank et al., 2010). In OBE, the emphasis is on what learners will be able to do upon programme completion. The deriving of the OBE model is to link the skills and abilities of learners to their expectations, however, in CBET, the drive towards competencies was the concern that graduates may lack some professional skills when they practice. The use of competencies in the CBET education system is considered a means to ensure that all practising graduates have the minimum requirements to practice successfully (Albanese et al., 2008). The construction of an OBE started by defining outcomes to guide all curriculum-related decisions including content, instructional and assessment methods (Harden, 1999). In CBET, the

outcomes are also defined first which are the abilities required for learners to achieve effective practice, yet it goes beyond learning outcomes to enhance the ability of learners to integrate knowledge, skills, attitudes and values to attain and maintain the expected performance level (Katoue and Schwinghammer, 2018).

To specify competency from outcomes in educational contexts, Albanese et al (2008) proposed the following five criteria:

- Focuses on the performance of the end product or goal state of instruction.
- Reflects expectations external to the immediate instructional programme
- Expressible in terms of measurable behaviour.
- Uses a standard for judging competencies that is not dependent on other learners' performance.
- Informs learners and other stakeholders of what is expected of them.

2.5.1.1 Potential challenges of implementing CBET

According to Frank et al (2010), there are some challenges of implementing CBET in health professions education and training. The challenges are:

- Defining and assessing competencies require breaking them down into smaller observable behaviour thereby creating endless lists that frustrate both learners and teachers.
- The focus on a comprehensive set of competencies may make learners understand that acquiring these milestones is the ultimate goal rather than the pursuit of excellence in practice.
- To be practical and effective, the adaption of the CBET approach requires new teaching technologies, modules and assessment tools on a larger scale.
- Adoption of CBET requires significant investment in teaching infrastructure and workforce which might be challenging in many jurisdictions.

2.5.1.2 Learning theories of CBET

One of the theories underpinning CBET is behaviourism (Albanese et al., 2008). According to this theory, knowledge is a repertoire of behavioural responses to

environmental stimuli which consequently make learning a behaviour change (Mohamed Ibrahim, 2018). That is, students can learn, unlearn and relearn behaviours and shape them through positive (i.e., rewards) or negative reinforcement (i.e., punishment)- making behaviours respectively more or less likely to be repeated. In this theory, reinforcement should be provided as quickly as possible after the behaviour occurs to maximise the effect of reinforcement (Mohamed Ibrahim, 2018).

In CBET, the emphasis on positive reinforcement is represented by measuring and quickly acknowledging whether a learner achieved competence (Albanese et al., 2008). Other relevant features of behaviourism in CBET are in the programme structure where the arrangement of instructional materials is relatively straightforward in consecutive steps. Another relevant feature is to allow students to work at their pace and take as much time as required to achieve a competency (Snelbecker, 1974; Albanese et al., 2008). It also uses modelling where the student imitates instructors who serve as a model by showing students, at least partly, the appropriate behaviour to copy (Snelbecker, 1974; Albanese et al., 2008). The modification of behaviours for learning in this theory requires measurable characteristics to be specified in advance in an objective manner describing the entry criteria, the instructional process for implementation and the evaluation criteria to assess students' progress. However, this theory has been criticised for developing learners who are dependent on external rewards, yet its ability to modify learners' behaviours, the central tenets of the CBET paradigm, is not questionable (Albanese et al., 2008).

Social constructivism is another theory underpinning CBET. According to this theory, learning is more than just gaining knowledge; it is also about participating in an active, contextualised process of knowledge construction (Mohamed Ibrahim, 2018). This theory challenges the belief that learning can be delivered by educators who transfer knowledge or facts to a group of passive recipient learners. Based on this theory, learners actively construct knowledge, meaning, and understanding through a development process, building on what they already know while

changing, adapting, and inventing new concepts. Therefore, in practice, the role of educators is to provide learners with experience and stimuli that allow them to explore, predict, hypothesise and investigate knowledge for themselves. Learners understand complex concepts better when they direct their learning process and are actively involved in learning through interaction with people, such as peers and preceptors. Case studies, research projects, simulations, small group work, problem-based learning and experiential training are examples and applications of this theory in CBET.

2.5.1.3 Progression of competencies in CBET

To guide and monitor students' progression of competencies in higher education, acquirement of competencies should be made through defining stages throughout the curriculum to assess whether students are progressing toward the expected competencies (Ten Cate and Scheele, 2007; Koster et al., 2017). Competence involves components that should be integrated and these components are affected by the practice settings and specific circumstances which can diminish or develop further over time (Katoue and Schwinghammer, 2018). This means becoming a competent practitioner is an ongoing process (Frank et al., 2010; Koster et al., 2017).

As described by Dreyfus's model for competency acquisition, competence is a developmental stage and improving performance is a continuum. In this model, competency acquisition occurs in six stages: novice, advanced beginner, competent, proficient, and expert (Dreyfus and Dreyfus, 1980) (Figure 2.2). In the novice stage, students are at the start of the professional curriculum, dependent on well-structured strategies and direct support from educators to acquire basic knowledge, skills and values (Chuenjitwongsa et al., 2018). In the advanced beginner stage, students start to apply their acquired knowledge and skills in different contexts (Katoue and Schwinghammer, 2018). At graduation, students are expected to be competent as they can independently practice, make decisions and assume responsibility for their professional growth. The proficient stage is achieved when they develop a more in-depth understanding of the skills required to deal with a

broad range of professional problems. This may be achieved after a few years in practice after obtaining the practice licensure or speciality training. At the point when practitioners can integrate and internalise professional practice, they are deemed experts. This may take decades or longer since the establishment of a professional programme to achieve this stage (Katoue and Schwinghammer, 2018).

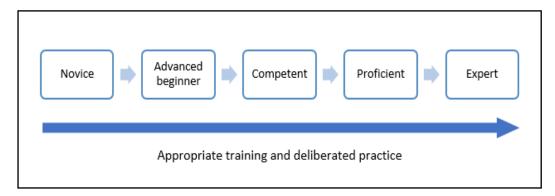


Figure 2.2: Spectrum of competency acquisition (Dreyfus and Dreyfus, 1980)

The transitional state from novice to expert requires practitioners to perform a cognitive or psychomotor skill in a specific aspect of performance intensely and repetitively to gradually enhance their performance in this aspect (Katoue and Schwinghammer, 2018). This requires focused training and deliberated practice along with rigorous skills assessment and informative feedback to advance individuals throughout this continuum in competence from novice to expert (Anders Ericsson, 2008).

2.5.1.4 Requirements for successful implementation of CBET

Koster et al (2017) described a stepwise approach to developing a CBET curriculum in pharmacy, as follows: identification of the required competencies; construction of the curriculum; selection of assessment methods; establishment of a teaching and learning environment; and curriculum evaluation and quality improvement.

Depending on local needs and urgency, implementing a CBET pharmacy curriculum can be challenging (Koster et al., 2017). Implementation requires institutional preparedness and the determination to support and facilitate the transformation

process. Consultation of all relevant stakeholders within and outside academia to identify required competencies and plan the curriculum must be considered (Koster et al., 2017). To achieve success, careful planning and preparation to design and maintain quality control of a curriculum are required (Albanese et al., 2010). Strong and supportive leadership is also important to harmonise and facilitate the transformation (Koster et al., 2017). A critical factor to consider when implementing a competency-based curriculum is faculty development, as academic faculty should have the appropriate training and clinical skills to contribute effectively to the preparation of competent graduates (Anderson et al., 2009). Effective implementation of a high-quality curriculum requires faculty to understand how to use active learning strategies, assessment and feedback methods effectively to provide a reliable and valid performance evaluation to learners (lobst et al., 2010; Katoue and Schwinghammer, 2018).

2.5.1.5 Stakeholders' engagement

In pharmacy education, assuring the quality of education requires ongoing cooperation and consultation among all relevant stakeholders within countries and institutions to achieve profession-wide consensus on a vision for pharmacy practice and professional education considering the required resources and implications of proposed changes in these discussions. The FIP's Global Framework for Quality assurance of pharmacy education recommended the engagement of the following stakeholders in any initiatives to develop or reform professional education: general public, professional and scientific associations, individual educators, students, practitioners from different sectors of pharmacy practice, pharmacy school deans, the pharmaceutical industry, continuing education providers, accreditation agencies, governmental agencies and regulatory bodies (International Pharmaceutical Federation, 2014). Their ability to identify needs, concerns and priorities make them credible experts and useful contributors to education reforms or development (Creswell and Creswell, 2017). The importance of the stakeholders' strategic discussions in education-related research is well documented (Jamshed et al., 2007; WHO, 2013b; WHO, 2006; WHO, 2008).

2.5.1.6 Competency based pharmacy education in different countries

The attention to CBET in pharmacy is relatively recent compared to other healthcare professions (Koster et al., 2017). Although it has been described in pharmacy literature since the 1970s (Krautheim, 1975; Knapp and Supernaw, 1977), the widespread acceptance of CBET by medical education has stimulated and renewed the recent interest in the CBET approach in pharmacy education (Katoue and Schwinghammer, 2018). In the early 1990s, the AACP pioneered this movement by developing outcomes-based guidelines for pharmacy education in the United States (American Association of Colleges of Pharmacy, 2013) which was subsequently followed by many countries (Koster et al., 2017; Katoue and Schwinghammer, 2018).

Currently, developed countries lead the development of CBET in pharmacy curricula (Katoue and Schwinghammer, 2018), which came about in response to the increased investment of health systems in pharmacy education and practice to provide patient-centred pharmacy services (Anderson et al., 2012). This reflects the development of globally recognised competency-based frameworks in these developed countries. Competency frameworks/standards in the United States, United Kingdom, Australia and New Zealand are used to design, map and or assessment of competency standards within undergraduate pharmacy curricula (Nash et al., 2015). Other countries such as Croatia and Japan also use competency frameworks in pharmacy education (Meštrović et al., 2012; Kiuchi et al., 2013).

In developing countries, clinical-oriented curricula may not fit pharmaceutical needs due to different pharmaceutical environments, job opportunities, limited academic infrastructure and human resources (Anderson and Futter, 2009). Nonetheless, attempts to develop need-based education have been reported in countries such as Zimbabwe, Thailand and Pacific-Island countries (Kapol et al., 2008; Brown et al., 2012; Katoue and Schwinghammer, 2018). However, there is no published pharmacy CBET model developed within developing countries (Katoue and Schwinghammer, 2018).

In the Eastern Mediterranean Region (EMR), most published literature describes the experiences of practitioners or students about education, training or practice of specific competencies rather than CBET implementation (Bajis et al., 2016). In addition, there is a scarcity of studies examining the competency of pharmacy graduates in practice settings which may be due to the lack of a local competency framework, as the EMR countries have yet to adopt a competency framework on a national level (Bajis et al., 2016). Some pharmacy schools in EMR still offer traditional knowledge-based curricula (Al-Wazaify et al., 2006; Kheir et al., 2008; Al-Ghananeem et al., 2018; Bajis et al., 2017) but in others, such as Kuwait, a CBET model of pharmacy education and training is currently under development (Al-Haqan et al., 2021). Saudi Arabia, which is the country context of this research, is one of the EMR countries.

2.6 Country context of research study

The context of this research is to explore the ability of pharmacy education to produce competent pharmacists that address the healthcare needs of pharmacy practice in Saudi Arabia. Therefore, this section provides an overview of the healthcare system, pharmacy practice and education in Saudi Arabia.

2.6.1 Saudi Arabia country profile

The Kingdom of Saudi Arabia, also known as Saudi Arabia, is one of the EMR countries located in the furthermost part of southwestern Asia (Figure 2.3). It is the largest country in the Arab Peninsula, occupying about four-fifths of the region, with a total area of around 2,000,000 square kilometres.



Figure 2.3: Geographic location of Saudi Arabia

Saudi Arabia has a total population of approximately 35 million. The population is overwhelmingly young, with approximately 25% aged between 0 and 14 years, 72% between 15 and 64 years, and about 3.2% older than 65 years (General Authority for statistics, 2020). The demographic population structure is composed of 61% Saudi nationals and 57.8% male.

Saudi Arabia is classified as a high-income economy country. The income of the country comes mainly from oil, which accounts for 90% of the country's revenue. The economic growth therefore is highly depending on the oil prices. To sustain the development wheel as per the country's strategic plan, the government launched a national transformation programme known as Saudi Arabia's Vision 2030 to advance the national economy and promote robust economic growth independently of oil as a traditional resource of income (Saudi Vision 2030, 2017). As a result, new regulations were set to reform the labour market to increase participation of the private sector in the economy as well as increase investment in Saudi nationals' education and training to meet the labour market needs and replace a significant proportion of the expatriate workforce.

2.6.2 Saudi healthcare system

2.6.2.1 Structure

Health services in Saudi Arabia are provided through three main sectors: the MOH, the other non-MOH government healthcare sector and the private healthcare sector. The MOH provides almost 57% of healthcare services to the public through a network of primary healthcare centres (PHCCs) located in large cities and small towns and hospitals in main cities (Ministry of Health, 2020). Other non-MOH governmental and private care facilities also contribute to the delivery of healthcare services covering around 17.8% and 24.7% of the total inpatient bed facilities in the country, respectively (Ministry of Health, 2020).

There are three levels of healthcare services: primary, secondary and tertiary. The provision of healthcare is through referral with a feedback system in which PHCC is the first line of healthcare and patients who need secondary or specialised care are

referred to the appropriate care facility (Almalki et al., 2011). Advanced cases are referred to a general hospital where they receive a secondary level of care, while patients with more complex health issues are transferred to either central or referral hospitals where they receive a tertiary level of care (Almalki et al., 2011).

2.6.2.2 Funding of health services

The healthcare system is predominantly funded by the government (75%) through annual budgets for individual ministries and programmes (Walston et al., 2008). The remaining 25% comes from private spending, either cooperative health insurance schemes or out-of-pocket payments (Walston et al., 2008; Al-Hanawi, 2017). In 2020, health expenditure accounted for 8.1% of the total government expenditure and about 5.7% of the country's GDP (Ministry of Health, 2020). This is an average expenditure of 1,316 US dollars per capita.

Government healthcare and services, including medications, are free for all Saudi citizens and expatriates working in the government sector primarily through MOH and other governmental health facilities (Almalki et al., 2011). Expatriates working in the private sector are required by the government to have the same level of healthcare coverage paid by their employers (Walston et al., 2008; Almalki et al., 2011).

2.6.2.3 Access and utilisation of health services

The typical pathway to access public health care services in Saudi Arabia is either PHCCs during working hours or the Emergency Department outside of working hours. Individuals having private medical insurance, including expatriates or Saudis working in private sectors, normally utilise private clinics and hospitals.

Prescriptions issued from PHCCs are dispensed free of charge either from an onsite pharmacy located on the PHCC premises or from a specific community pharmacy that is part of the "Wasfaty", translated to "my prescription", programme (Wasfaty, 2021). Prescriptions issued from private institutions are also dispensed from community pharmacies for a fee.

PHCCs provide primary and basic care services, both preventive and curative, including immunisation for communicable diseases, maternal and child health, health education as well as general clinics, chronic diseases clinics, dental care clinics and essential drugs dispensaries (Ministry of Health, 2020). Being the only provider of primary care services, the PHCCs network is currently scattered across the country associated with local general hospitals.

However, there is great variation across and within regions in terms of the number of PHCCs as well as the services, facilities and human resources (Al Saffer et al., 2021). Over the years, the capacity of PHCCs does not seem to correlate with the population growth in Saudi Arabia. Figure 2.4 illustrates the trend in the number of PHCCs in Saudi Arabia over the last seven years.

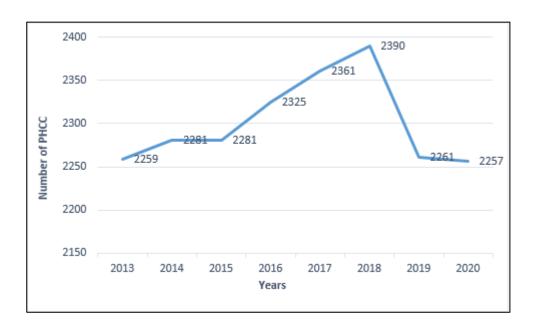


Figure 2.4: Number of Primary Healthcare centres (PHCCs) from 2013 to 2020 in Saudi Arabia. Data obtained from MOH Annual report (2020)

Overall, there are 0.64 PHCCs for every 10,000 population in Saudi Arabia (Ministry of Health, 2020). The low rate of PHCCs has been explained in literature by the previous focus of the MOH on developing secondary and tertiary care services which decreased the stress on investments provided to develop primary healthcare infrastructure and services (Almutairi and Al Shamsi, 2018; Al Asmri et al., 2019; Al Saffer et al., 2021). The MOH's focus on secondary and tertiary care services

resulted in 90% of the infrastructure and development fund being spent on hospitals rather than PHCCs (Al Asmri et al., 2019).

Several households and individual satisfaction surveys about PHCCs services in Saudi Arabia showed that most of the surveyed population were not satisfied with the current capacity of primary health care services in the country. The main reasons for their dissatisfaction were the distance from their homes to the PHCCs, waiting times, working hours, facilities, services, absence of speciality clinics as well as communication and language barriers (Al Asmri et al., 2019; Al Saffer et al., 2021; Senitan et al., 2018). Al Asmri et al (2019) cited the lack of alternative venues for primary care services as the main reason for the Saudi population to accept the current services of PHCCs despite their dissatisfaction.

2.6.2.4 Challenges of health system

There are some challenges currently facing the Saudi health system that need to be addressed to meet the increasing demand for health care services, as follows:

2.6.2.4.1 Demographic and epidemiologic changes

The population in Saudi Arabia continues to grow and age and is expected to rise from 35 million in 2020 to 39.5 million in 2030 (Ministry of Health, 2017; Ministry of Health, 2020). The elderly population is also expected to increase from 1.1 million in 2020 to 4.6 million in 2030, with the proportion of the population living in urban areas expected to increase from 83% in 2020 to 85.9% in 2030.

Compared to other countries, the rate of non-communicable chronic diseases (NCDs) remains high in Saudi Arabia while there is a considerable scope to reduce avoidable mortality and morbidity in both the young and elderly populations (Ministry of Health, 2017). Particular areas of concern include diabetes, heart diseases, respiratory diseases and cancer (WHO, 2013a; Alqunaibet et al., 2021). Between 2009 and 2019, there was an increase in the incidence of cardiovascular diseases in Saudi Arabia by 54%, cancer by 50%, diabetes by 94% (from 90,400 to 176,000 new cases annually) and chronic respiratory diseases by 48% (Alqunaibet et

al., 2021). In 2019, 51% of deaths were caused by the four NCDs: 35.7% from cardiovascular diseases, 10.2% from various cancers, 2.9% from chronic respiratory diseases and 2.3% from diabetes (Alqunaibet et al., 2021). At the current level of prevention and control of NCDs in Saudi Arabia, the WHO estimated that 16.4% of those aged between 30 and 70 (14.2% women and 17.8% men) will die from one of the major four NCDs (WHO, 2020).

Both behavioural risk factors (tobacco use, unhealthy diet and physical inactivity) and biological risk factors (obesity, high blood pressure, elevated blood glucose and abnormal lipid level) contribute to the development of NCDs in Saudi Arabia (WHO, 2013a; Alqunaibet et al., 2021). This puts tremendous pressure on the health system and government budget and resources, especially as Saudi healthcare services are free of charge and the public health services expenditure comes from the government (Almalki et al., 2011). Therefore, interventions and reforms to prevent NCDs and minimise current and future treatment costs are urgently needed.

2.6.2.4.2 Distribution of services and workforce

There is inadequacy and inconsistency in the distribution of primary, secondary and tertiary healthcare services and associated resources across the country: 50.6% of hospitals in the country are concentrated in Riyadh and Jeddah cities, while 34.3% of the PHCCs are located in Riyadh and Makkah provinces (Albejaidi and Nair, 2019; Al Saffer et al., 2021). The multiplicity of sectors to provide healthcare services alongside the poor coordination or clear channels for communication have led to duplication of efforts and wastage of resources (Almalki et al., 2011).

The heavy reliance on the expatriate population poses multiple challenges to the Saudi health system. The diversity of the workforce from multiple countries has created skill imbalance and inefficacy in the health system performance. The diversity of education and training of the workforce can result in differing professional competencies even within the same profession (Khoja et al., 2017; Al Asmri et al., 2019). This limits the training and development initiatives by health

institutions as continuity and retention of an upskilled workforce are not guaranteed (Almansour et al., 2020b). The dependence on the expatriate workforce in the health system is risky. In the event of natural disasters, pandemics or any change in the political relationships between the "sending" countries and Saudi Arabia could cause the rapid withdrawal of large numbers of healthcare professionals thus the health system may struggle to provide care (Alluhidan et al., 2020). As most of the workforce is recruited from multiple countries, the differences in religion, language, culture and social values create barriers between patients and healthcare providers (Al-Mahmoud et al., 2012; AlYami and Watson, 2014; Albejaidi and Nair, 2019). Another challenge is the high turnover rate and instability of the expatriate workforce in Saudi Arabia. A large number of doctors, nurses and paramedical staff migrate to Western countries after working for a few years in Saudi Arabia to take the advantage of better training facilities and stable work opportunities (Albejaidi and Nair, 2019).

2.6.2.5 Health development strategies

Realising the current challenges and needs of the system as well as the population, the Saudi government launched a national transformation strategy in 2016 to modernise the health sector, as part of the Saudi Vision 2030. The strategy laid by the Saudi Vision 2030 for the health sector adopted three pillars:

- Improve the accessibility of healthcare services by improving the infrastructure and increasing the number of healthcare professionals; adequate geographical distribution: and improving the referral system and appointments.
- Improve the quality and efficiency of healthcare services.
- Promote health education and disease prevention.

2.6.3 Pharmacy in Saudi Arabia

The practice of pharmacy in Saudi Arabia is largely product-oriented, with the pharmacist's role in almost all hospitals and community pharmacies mainly related to medication dispensing (Almeman and Al-jedai, 2016). The presence of clinical services in primary health settings, including PHCCs and private community pharmacies, is limited and dependent on individual initiatives (Kheir et al., 2008; Khan et al., 2020). At these settings, there is no access to patient medical history or medications profile. However, in tertiary care hospitals located in major cities, the clinical role is well developed with many pharmacists run specialised clinics in many areas of pharmaceutical care such as ambulatory care, solid organ transplant, infectious diseases and cardiology and have prescriptive authority within their institutions (Al-jedai et al., 2016; Almeman and Al-jedai, 2016; Badreldin et al., 2020). These roles are delivered by clinical pharmacists who have a recognised postgraduate Master's degree in Clinical Pharmacy or postgraduate pharmacy practice residency training from either a national or international institution (Badreldin et al., 2020).

The following section will shed light on pharmacy policy and regulations, practice settings and services, education and training, and challenges as well as recent policy transformation for the profession in Saudi Arabia.

2.6.3.1 Pharmacy related rules and regulations

In Saudi Arabia, the pharmacy profession is regulated and governed by several governmental authorities. The pharmaceutical care department of the MOH has a key role in the overall regulation of the pharmacy profession practice as well as the development of regulations and laws that govern pharmaceutical products and institutions. It also provides pharmaceutical services within its hospitals, such as the compounding and dispensing of medicines, management of medicine storage and supply, provision of drug information as well as advanced specialist pharmaceutical clinical services (Almeman and Al-jedai, 2016; Almaghaslah et al., 2018). The Saudi Food and Drugs Administration (SFDA) is responsible for the governance of all medication-related policies and activities such as manufacturing, registration,

pricing, marketing and post-marketing issues as well as medications efficacy and safety. It is also responsible for wholesalers, retail distributors and private manufacturers (Almeman and Al-jedai, 2016). The Saudi Commission for Health specialities (SCFHS) is responsible for the licensing and registration of all healthcare providers in Saudi Arabia, as well as developing and accrediting pharmacy residency programmes at various internship sites throughout the country (Saudi Comission for Health Specialities, 2014). The Saudi Pharmaceutical Society (SPS) is the pharmacy professional society that represents more than 4,000 pharmacists in Saudi Arabia. It develops and provides continuing education programmes accredited by the ACPE (Al-jedai et al., 2016). The Ministry of Education regulates and imposes policies as well as long-term plans for all higher education institutions (Alkhazim, 2003). The Ministry of Human Resources and Social Development is responsible for the recruitment of pharmacy graduates in the governmental sector. The National Commission for Academic Accreditation and Assessment (NCAAA) undertakes the responsibility of accreditation for a broad range of higher education programmes including pharmacy (National Center for Academic Accreditation and Evaluation, 2022a).

Only Saudi pharmacists can own community pharmacies (MOH, 2019). Non-pharmacists, either Saudi or non-Saudi, can partner with Saudi pharmacists in the establishment and ownership of a community pharmacy. However, a licensed pharmacist should manage the pharmacy, regardless of the nationality. All pharmacists must be licensed by the SCFHS to practise in Saudi Arabia (Saudi Comission for Health Specialities, 2014).

2.6.3.2 Medicine regulation and supply

Pharmacies must be managed by at least one licensed pharmacist with the help of the required number of licensed pharmacists or licensed pharmacy technicians working under the supervision of the pharmacy manager. The pharmacists must be present at all times. Prescriptions must be dispensed by a pharmacist only or a pharmacy technician under the supervision of the licensed pharmacist. Therefore, it is rare to find unlicensed staff working on pharmacy premises but non-pharmacist

support personnel can be recruited to sell other non-medicinal products (MOH, 2019).

The SFDA regulates all matters related to medicines, herbal products and food supplements, as well as prescribing restrictions on some medicines based on the speciality and licence classification of physicians (Al-jedai et al., 2016). While they can place prescribing restrictions on both physicians and non-physician healthcare providers, some healthcare institutions may grant prescriptive authority to non-physician healthcare providers, such as nurses and pharmacists (Al-jedai et al., 2016). Non-physicians with prescribing authorities are allowed to prescribe medicines under a collaborative practice agreement with physicians and within their scope of practice. For controlled drugs, prescribing is restricted to physicians in hospital and community settings.

Medicines can be kept and sold only in pharmacies. Pharmacists are the only authorised healthcare professional to dispense medications (Ministry of Health, 2005). Except for emergency medicines, other healthcare professionals are prohibited to keep or dispense medications from their clinics or offices, therefore, each hospital has onsite pharmacy services that provide inpatient, outpatient and emergency pharmaceutical services (Ministry of Health, 2005). In PHCCs, there is usually one onsite pharmacy from which patients can obtain their prescriptions. Private polyclinics, however, are not licensed to open their pharmacies as part of the polyclinic, so patients visiting polyclinics need to go to the community pharmacy for their medications. Pharmacists are not allowed to diagnose a patient's disease or to dispense medications without a valid prescription (Ministry of Health, 2005).

The medicines in Saudi Arabia are classified into three classes: prescribed medicines which require a prescription to be dispensed; behind the counter out of patient reach but can be dispensed by a pharmacist without a prescription; over the counter within patient reach and can be accessed without a prescription (Al-jedai et al., 2016). Controlled medicines are strictly regulated and audited by the SFDA. Special permission is required to stock and dispense controlled drugs in a pharmacy

where further security requirements must be fulfilled for storage and dispensing (Almeman and Al-jedai, 2016).

2.6.3.3 Pharmacy workforce

In 2020, there was a total of 27,529 pharmacists in Saudi Arabia which represented 7.9 pharmacists for every 10,000 of the population (Ministry of Health, 2020). When compared with other countries, the rate of pharmacists in Saudi Arabia is higher than in Canada (6.7) and less than in the United States (8.8) (AlRuthia et al., 2018a). The private sector, including community pharmacies, the pharmaceutical industry and private healthcare establishments, is the major employer of pharmacists in Saudi Arabia. It employs 74% (20,411) of all pharmacists, of which, 87% (17,815) are in community pharmacies (Ministry of Health, 2020).

Similar to other health professions in Saudi Arabia, there is a heavy reliance on an expatriate workforce in pharmacy due to the shortage of local pharmacists. Saudi pharmacists constitute around 35% (9,687) of all pharmacists with 66% (6,416) working in the governmental sector. Non-Saudi pharmacists constitute around 65% (17,842) of all pharmacists with 87% (15,544) working in community pharmacies (Ministry of Health, 2020). Within the private sector, the proportion of Saudi pharmacists represents 16% (3,269), of which, around 70% (2,271) work in community pharmacies. The evidence presented by Almaghaslah et al (2018) and AlRuthia et al (2018a) suggests that the shortage of Saudi pharmacists is due to the existence of only one school of pharmacy for 42 years as the sole source of native pharmacists for the whole country.

Females constitute around 19% (n=5,208) of all pharmacists in the country (Ministry of Health, 2020). In the private sector, female pharmacists represent 11.7% (n=2,394) of the workforce, of which, 66% (n=1,583) are Saudis and 53% (n=1,262) are in private hospitals. In the governmental sector, the percentage of females is 54% (2,806), of which, 88% (2,490) are Saudis and 58% (1,634) are in MOH facilities. Almaghaslah et al (2018) cited social, cultural and religious factors as well as limited job opportunities available for female pharmacists as the main reasons for their

limited participation within the pharmacy workforce in Saudi Arabia. Although the Ministry of Labour has recently allowed female pharmacists to work in community pharmacies, it limited job opportunities to community pharmacies that can provide a better work environment for female pharmacists, namely, those linked to private healthcare establishments or located in shopping malls (Almaghaslah et al., 2018; Balkhi et al., 2020). According to Almaghaslah et al (2018), unless all settings and locations of community pharmacies are considered for female employment, this restriction still limits job opportunities for female pharmacists (Almaghaslah et al., 2018). Table 2.3 illustrates the distribution of pharmacists in Saudi Arabia by sector, nationality and gender.

Table 2.3: Distribution of pharmacists in Saudi Arabia by sector, nationality and gender. Data obtained from MOH annual report (2020)

Sector	Gender	Nationality		Total
		Saudi	Non-Saudi	
Ministry of Health	Male	2655	69	2724
	Female	1559	75	1634
	Total	4214	144	4358
Other governmental sectors	Male	1263	325	1588
	Female	931	241	1172
	Total	2194	566	2760
Private hospitals	Male	281	598	879
	Female	579	683	1262
	Total	860	1281	2141
Private Clinics	Male	41	151	192
	Female	39	16	55
	Total	80	167	247
Supportive service centre of MOH	Male	2	2	4
	Female	8	0	8
	Total	10	2	12
Community Pharmacies	Male	1340	15440	16780
	Female	931	104	1035
	Total	2271	15544	17815
Other institutions (pharmaceutical	Male	24	130	154
industries, drug stores, scientific	Female	34	8	42
offices)	Total	58	138	196
Total number of pharmacists in Saudi Arabia in 2020				

There is an unequal geographical distribution of pharmacists in the country (AlRuthia et al., 2018a; Almaghaslah et al., 2018). The highest proportion of pharmacists is located in urban cities, such as Jeddah (9.8 pharmacists per 10,000 population) and Riyadh (9.8 pharmacists per 10,000 population) and the lowest proportion is in rural areas, such as Albaha (4.4 pharmacists per 10,000 population) and Bisha (4.6 pharmacists per 10,000 population) (AlRuthia et al., 2018a; Almaghaslah et al., 2018). According to AlRuthia et al (2018a), this unbalanced distribution of pharmacists suggests that the recruitment of the immigrant workforce does not target underserved areas. Almaghaslah et al (2018) cited the availability of advanced facilities, transportation conditions and better schools as

the reasons behind the preference of pharmacists for cities compared to rural areas.

2.6.3.4 License to practise

Pharmacists must fulfil the licensing requirements to practice pharmacy in Saudi Arabia. This includes completion of a PharmD or a Bachelor's degree in Pharmaceutical Sciences (BPharm) from a recognised local or international higher education institution and passing the Saudi Pharmacists Licensure Examination (SPLE) by the SCFHS (Saudi Comission for Health Specialities, 2014; Saudi Comission for Health Specialities, 2018). Before 2019, graduates from local higher education institutions licensed by the Ministry of Education were allowed to practice pharmacy directly upon registration without sitting any professional exams (Saudi Comission for Health Specialities, 2014). In January 2019, the SCFHS mandated SPLE as a registration requirement to ensure that practising pharmacists have minimal knowledge for safe practice according to the medical ethics and practice applied in the country. SPLE tests pharmacists' knowledge in four major pharmacy aspects: basic biomedical sciences (10%), pharmaceutical sciences (35%), social/behavioural/administrative sciences (20%) and clinical sciences (35%) (Saudi Comission for Health Specialities, 2018).

Both PharmD and BPharm graduates sit the same licensure exam and register as pharmacists by the SCFHS. Graduates from overseas pharmacy schools must also sit the licensure exam and verify their certificates through the SCFHS data flow system. Not all pharmacists have to sit the licensure exam as it is only for those who want to practise in healthcare institutions. Those who want to work in regulatory institutions, the pharmaceutical industry and academia are not required to sit the exam. After registration, there are three possible classifications for registered pharmacists based on their educational qualifications, training and experience. This classification determines the pharmacist's salary based on a unified pay scale for pharmacists working in the health sector (Al-jedai et al., 2016).

2.6.3.5 Areas of practice

2.6.3.5.1 Hospitals

The practice of hospital pharmacy in Saudi Arabia is considered one of the best and most advanced practices in the EMR (Al-jedai et al., 2016). There are differing responsibilities for hospital pharmacists, including but not limited to verification and dispensing of medications, preparing different dosage forms, drug safety monitoring and reporting, medication storage and planning of required quantities of formulary medications, provision of drug information to other healthcare providers and training of students and residents (Almeman and Al-jedai, 2016). Some pharmacists participate in the preparation of pharmaceuticals in specialised areas such as parenteral nutrition and sterile production (Al-jedai et al., 2016). Some pharmacists also conduct medication therapy management through discharge counselling or pharmacist-run clinics.

However, many of the above-mentioned services are provided mainly in large tertiary care and teaching hospitals within MOH and non-MOH health institutions of the governmental sector where established policies, procedures, pathways and qualified manpower exist (Al-jedai et al., 2016). The gap in practice between the private and the governmental sector may exist because of the lack of a national comprehensive and integrated health system, different governance systems and policies within each sector and the lack of coordination between them (Al-jedai et al., 2016; Almeman and Al-jedai, 2016). Therefore, pharmaceutical care services vary across pharmacy institutions as the concept of clinical pharmacy is not fully developed effectively in all sectors and the role, position and responsibilities of clinical pharmacists within health teams are not clear and unregulated.

In hospitals, residency training is not a requirement to practice as staff pharmacists, with pharmacists hired based on their qualification and experience (Al-jedai et al., 2016). Despite that, hospital pharmacists often possess advanced qualifications, which assumes a higher level of quality practice in hospital settings than in many community pharmacies (Kheir et al., 2008; Al-jedai et al., 2016; Almaghaslah et al., 2018; AlRuthia et al., 2018a).

Of note, most Saudi pharmacists practise in hospitals (Al-jedai et al., 2016; AlRuthia et al., 2018a). Some studies attributed better salaries and higher job satisfaction, CPD opportunities, promotion opportunities, clear policy and procedures and electronic documentation and health information systems in hospitals as the reasons for Saudi pharmacists preferring to work in hospitals rather than in community pharmacies (Al-jedai et al., 2016; Almaghaslah et al., 2018; AlRuthia et al., 2018a).

The highest proportion of Saudi pharmacists work in government hospitals compared to those working in private hospitals, 60% and 9% respectively (Table 2.6) (Ministry of Health, 2020). In addition to the above-mentioned reasons, Badreldin et al (2020) cited the "Saudisation" initiative that aimed to replace the expatriate workforce in the governmental sector, including the pharmacy profession, as another possible reason for the preference for governmental over private hospitals.

2.6.3.5.2 Community pharmacy

Community pharmacies are considered one of the largest private health sectors in Saudi Arabia, with more than 9,000 privately owned pharmacies (Ministry of Health, 2020), many of which are attached to private hospitals or polyclinics. The dominant practice of community pharmacists is dispensing medications and the sale of health-related products and cosmetics (Almeman and Al-jedai, 2016). Until recently, the provision of pharmaceutical care services for specific chronic diseases was subject to many restrictions and there was no enforcement on providing medication counselling for patients (Albabtain et al., 2021).

Despite being the predominant role of pharmacists, the provision of medication dispensing and medication counselling services in community pharmacies is reported to be suboptimal in the literature (Al-jedai et al., 2016; Almeman and Al-jedai, 2016; Albabtain et al., 2021; Alrasheedy et al., 2017; Almaghaslah, 2022). For many years, pharmacists continued dispensing prescription-only medicines, such as antihypertensive drugs, antibiotics, and antidepressants without a prescription (Al-

jedai et al., 2016; Alrasheedy et al., 2017; Albabtain et al., 2021). Although it is legally not allowed, this was a common phenomenon and has been an issue of concern over the last three decades in Saudi Arabia given that community pharmacists in Saudi Arabia lack adequate training and skills to diagnose and/or prescribe medicines (Khan and Ibrahim, 2013; Bin Abdulhak et al., 2011; Al-Freihi et al., 1987; Al-Ghamdi, 2001; Al-Mohamadi et al., 2013; Bawazir, 1992). Many studies cited this negative practice as a result of the lack of pharmacy leadership, and insufficient enforcement of prescription laws by the MOH, the sole regulator of community pharmacy, for almost all medicines except controlled drugs (Al-jedai et al., 2016; Almeman and Al-jedai, 2016; Albabtain et al., 2021). Another reason was the profit-oriented mindset of most of community pharmacy owners, who by law can be of non-pharmacy background (Alanazi et al., 2016; Alrasheedy et al., 2017; Albabtain et al., 2021). However, malpractices related to dispensing has significantly improved recently as a result of the updated regulations in 2018 and the greater enforcement of MOH laws related to dispensing (Alrasheedy et al., 2020). Yet the above practices have affected the image of pharmacists as healthcare professionals (Alaqeel and Abanmy, 2015; Khojah and Abdalla, 2019; Alfadl et al., 2018; Alrasheedy et al., 2017; Albabtain et al., 2021) with Bawazir (2004) study indicating that 56% of consumers considered that pharmacists are more concerned with business than with health.

In comparison to hospital pharmacies, the practice in community pharmacy is underdeveloped and receives less attention from pharmacy leadership. In community pharmacy, there is a lack of integrated patient medical records and electronic documentation resulting in difficulties keeping patient medication records updated, retrieving patient medical history, or communicating with the primary care providers (Al-jedai et al., 2016).

Another area of concern in community pharmacy is the various educational backgrounds, skills and expertise of the workforce which may cause varying performance as most community pharmacists are non-Saudi (Al-jedai et al., 2016; Almeman and Al-jedai, 2016; Albabtain et al., 2021). Non-Saudi pharmacists comes

mainly from the Middle East and Far East countries, of which, around 60% are from Egypt (Al-jedai et al., 2016; AlRuthia et al., 2018a). Most have BPharm degrees and their training does not include much or even any practice-based learning (Al-jedai et al., 2016).

Saudi pharmacists tend to avoid working in community pharmacy due to the unattractive salary, hours of operation, job satisfaction, scope of practice as well as insecurity and instability that many Saudi graduates perceive from working in the private sector (Balkhi et al., 2020; Albabtain et al., 2021; Al Ghazzawi et al., 2017). The stigma of being a salesperson and the consequent concerns associated with this perception such as social unacceptance, underestimation, embarrassment and lack of appreciation by family, friends, and community also make graduates reluctant to work in community pharmacy (Balkhi et al., 2020). Community pharmacy owners have also been reported to contribute to the shortage of Saudi pharmacists in community pharmacies as they prefer to hire non-Saudi pharmacists due to their lower salaries and flexibility regarding location (Almaghaslah et al., 2018).

2.6.3.5.3 Industrial pharmacy

Saudi Arabia has the largest pharmaceutical market in the region with a share of 60% of the total pharmaceutical sales of the Gulf Corporative Council (GCC) countries including Kuwait, Bahrain, Qatar, United Arab Emirates and Oman (Alrasheedy et al., 2017). The expenditure on pharmaceuticals in Saudi Arabia made up about 20% of the total health expenditure in 2018 (Tawfik et al., 2021). The size of the pharmaceutical market has grown from 14 billion SR in 2012 to 28 billion SR in 2016 and is expected to reach 40 billion SR in 2023 (Tawfik et al., 2021). Several factors contributed to this expansion including population growth which led to the increased demand for medicines as well as the increasing prevalence of chronic diseases requiring medicines for long-term management (Alkhenizan, 2014; Tawfik et al., 2021).

Currently, there are more than 40 licensed and certified Good Manufacturing

Practice (GMP) drug manufacturers in Saudi Arabia (Tawfik et al., 2021). Most local

manufacturers produce generic products, and formulations and package raw materials into finished products with no innovative research and development arms (Almeman and Al-jedai, 2016).

2.6.3.5.4 Public health

Until recently, health promotion and education by pharmacists were not reflected in any governmental guidelines (Almeman and Al-jedai, 2016). Some pharmacists, mainly from hospitals, may participate in health awareness campaigns for national and international disease awareness, such as Diabetes Day and many other similar occasions shared by other health practitioners worldwide. The participation is mainly through distributing health educational materials, such as brochures or booklets to the patients or the public in shopping malls, hospitals or schools (Almeman and Al-jedai, 2016). Pharmacy students, who are supervised by senior or consultant pharmacists, may participate in such activities.

2.6.3.6 CPD

CPD activities are mandatory for pharmacists' re-registration in Saudi Arabia. Pharmacists are required to complete at least 20 hours per year of CE to maintain licensure. These CE hours can be acquired from attending conferences, workshops, seminars or training courses accredited by the SCFHS. Despite being mandatory for re-registration, these activities maybe unstructured, scattered and lacking a systematic approach that targets pharmacists' individual educational and professional developmental needs (Almaghaslah and Alsayari, 2021; Almaghaslah et al., 2022).

2.6.3.7 Pharmacy development strategies

To align with the government plans for the health sector transformation under the Saudi Vision 2030, the MOH projected a strategic plan to transform the model of pharmacy practice from the traditional inpatient model of pharmaceutical care services to ambulatory pharmaceutical care services provided in community pharmacies (Alomi, 2017). Under the new model of practice, the MOH released its

previous restrictions on providing clinical services in community pharmacies and expanded pharmacists' roles to involve a range of new patient-oriented pharmaceutical services. The new model specified services that can be provided in community pharmacies and set several rules, regulations, initiatives and programmes to enable the implementation and execution of these new services in community pharmacies (Ministry of Health, 2019). The new clinical responsibilities in community pharmacy include vaccination, patient education and counselling, vital signs assessment, medication therapy management and chronic diseases management, medical devices education, acute care services, pharmaceutical compounding and pharmaceutical consultations. These changes have encouraged large chain community pharmacies in Saudi Arabia to provide health education services in their pharmacies (Albabtain et al., 2021). Some pharmacies are now offering specialised services for diabetes education, obesity and weight management programmes and specialised pharmaceutical education for the elderly, which are mostly free (Khan et al., 2020). However, these services are only provided in some branches of large chain community pharmacies and are not commonly found in all community pharmacies across the country (Albabtain et al., 2021).

With the new model of practice, the role of the pharmacist in community pharmacies will be beyond merely medication dispensing and basic medication counselling, becoming patient-oriented with a focus on patient education and disease prevention in addition to disease treatment and management services. The new model of care utilises the accessibility of community pharmacies to achieve better health outcomes for individuals and societies. Based on other countries' experiences, expanding the roles of community pharmacists in Saudi Arabia could support the Saudi healthcare system in terms of reducing the physicians' workload, improving quality of care, optimising drug therapy management, reducing healthcare costs and easing pressure on PHCCs and hospitals (Smith et al., 2011; Dunlop and Shaw, 2002; Giberson et al., 2011a).

2.6.3.8 Undergraduate education

2.6.3.8.1 Overview

The history of national undergraduate pharmacy education began in 1959 with the establishment of King Saud University's (KSU) College of Pharmacy in Riyadh, the first school of pharmacy in Saudi Arabia and the GCC countries (Kheir et al., 2008; Almeman and Al-jedai, 2016; Alhamoudi and Alnattah, 2018). Forty-two years later, the second school was established at King Abdulaziz University in Jeddah, where the first PharmD programme started in the GCC region (Kheir et al., 2008; Alhamoudi and Alnattah, 2018). Thereafter, from 2001 to 2018, the total number of pharmacy schools reached 30, of which, 22 are governmental colleges and 8 are private, distributed throughout the country (Alhamoudi and Alnattah, 2018; Badreldin et al., 2020). This dramatic increase was due to the government's "Saudisation" plan, mentioned earlier, to expand and support higher education in the country (Alhamoudi and Alnattah, 2018). As a result, student intake greatly increased from 650 in 2008, to 6,391 in 2012 to reach 12,279 in 2020 (Kheir et al., 2008; Ministry of Health, 2020). In the academic year 2018-2019, there were 1,983 graduates from the local pharmacy schools, of which, 60% (1,190) were female (Ministry of Health, 2020).

2.6.3.8.2 Degrees and programmes

Of the 30 pharmacy schools offering the initial pharmacy degree, 19 offer the PharmD degree, 6 offer BPharm and 5 offer both (Badreldin et al., 2020). PharmD is a clinical oriented degree that integrates more pharmacy practice courses and clinical internship rotations within the curriculum more than the BPharm degree. In some programmes, there is a possibility for students who started the BPharm programme to progress into the PharmD programmes if they meet specific criteria (Al-jedai et al., 2016). According to Aljadhey et al (2017), the reason for the existence of two pharmacy programmes is the various pharmacy practice options available for PharmD or BPharm graduates as an entry-degree to practice in Saudi Arabia. However, according to governmental guidelines, both programmes have the

same job opportunities and similar responsibilities within all pharmacy practice sectors with no job specification for either degree over the other.

There are inconsistencies in the names of programmes and degrees awarded to graduates. For example, there are four differently-named undergraduate pharmacy programmes, namely: PharmD and Clinical Pharmacy (which are aligned with PharmD); Pharmaceutical Sciences and Pharmacy (which are aligned with BPharm). It has been suggested that the inconsistency is due to the lack availability of a pharmacy education association to unify programme names and degrees, as well as issues in the translation and understanding of the pharmacy profession as most college deans are not pharmacists (Alhamoudi and Alnattah, 2018).

Due to the increased demand for advanced practitioners and clinical pharmacists to provide pharmaceutical care services in hospitals, the vast majority of the newly established schools adopted the PharmD programme instead of the traditional BPharm programme (Al-jedai et al., 2016; Almeman and Al-jedai, 2016; Badreldin et al., 2020). Historically, the PharmD in Saudi Arabia was established by the King Abdulaziz University School of Pharmacy in 2001 (Kheir et al., 2008). Meanwhile, KSU opted to keep the BPharm as a parallel degree to the newly established programme allowing the students to elect which degree to pursue (Sayed and Al-Shehri, 2012). Nonetheless, there are very limited studies regarding the establishment of PharmD and its rationale. One study cited the reason for PharmD establishment in Saudi Arabia was the lack of clinically-oriented undergraduate programmes and extensive postgraduate training as the only pharmacy school in the country, i.e. KSU College of Pharmacy, provided only BPharm degree for more than 40 years. To the authors, this situation stressed the need to establish a PharmD degree to cope with the development of pharmaceutical care services, especially in tertiary care hospitals (Al-Haidari and Al-Jazairi, 2010). Therefore, many new pharmacy schools established a PharmD programme only to meet the pharmaceutical services needs of clinically-oriented pharmacists (Alkhateeb et al., 2018). Consequently, this has led to an increased number of PharmD graduates, with the proportion of PharmD graduates increasing from 30% in 2000 to 90% in

2018 (Badreldin et al., 2020), indicating that the BPharm degree may eventually be phased out (Kheir et al., 2008; Al-jedai et al., 2016; Almeman and Al-jedai, 2016; Aljadhey et al., 2017; Alkhateeb et al., 2018).

2.6.3.8.3 Curriculum

There BPharm and PharmD curricula have different characteristics across various schools in Saudi Arabia. The BPharm programme is composed of a minimum of five academic years with credit hours ranging from 168 to 228 in different colleges, whereas the PharmD is six academic years with credit hours ranging from 205 to 220 (Table 2.4) (Al-jedai et al., 2016; Badreldin et al., 2020; Kheir et al., 2008; Alhamoudi and Alnattah, 2018).

Table 2.4: Curriculum characteristics of Pharmacy schools in Saudi Arabia

No.	University/College Name	Programme Offered	Programme Name	Credit hours	Study Period (years)	Gender
1	King Saud University	BPharm	Pharmaceutical	174	5	M/F
			sciences	201	6	
		PharmD	PharmD			
2	King Abdulaziz University	PharmD	PharmD	214	6	M/F
3	King Khalid University	BPharm	Pharmaceutical	171	5	M/F
			sciences	198	6	-
		PharmD	PharmD			
4	King Faisal University	PharmD	Clinical	174	6	M/F
	-		pharmacy			
5	Qassim University-	PharmD	PharmD	195	6	M/F
	Buraydah					
6	Qassim University-Unaizah	PharmD	PharmD	203	6	M/F
7	Taibah University	BPharm	Pharmaceutical	181	5	M/F
			sciences	218	6	
		PharmD	PharmD			
8	Taif University	PharmD	PharmD	NA	6	M/F
9	Umm Al-Qura University	BPharm	Pharmaceutical	180	5	M/F
	•		sciences	221	6	-
		PharmD	PharmD			
10	Jouf University	BPharm	Pharmaceutical	178	5	M/F
			sciences			
11	Najran University	BPharm	Pharmaceutical	168	5	М
			sciences			
12	Princess Nora	PharmD	PharmD	210	6	F
	University/Riyadh-					
13	Prince Sattam bin	BPharm	Pharmaceutical	170	5	M/F
	Abdulaziz University		sciences			
14	Jazan University	PharmD	PharmD	218	6	M/F

No.	University/College Name	Programme Offered	Programme Name	Credit hours	Study Period (years)	Gender
15	King Saud bin Abdulaziz University for Health Sciences	PharmD	PharmD	219	6	M/F
16	Northern Borders University	PharmD	PharmD	215	6	M/F
17	Shaqra University	PharmD	PharmD	NA	6	M/F
18	Al-Baha University	PharmD	Clinical pharmacy	202	6	М
19	Hail University	PharmD	PharmD	NA	6	M/F
20	Immam Abdulrhamn bin Faisal University	PharmD	Clinical pharmacy	228	6	M/F
21	Tabuk University	PharmD	PharmD	215	6	М
22	Riyadh Elm University	BPharm PharmD	Pharmaceutical sciences PharmD	168	5	M/F
23	Ibn Sina National College for Medical Studies	PharmD	Clinical pharmacy	197	6	M/F
24	Almaarefa Colleges for Sciences and Technology	PharmD	PharmD	171	6	M/F
25	Batterjee Medical College	PharmD	PharmD	205	6	M/F
26	Buraydah Colleges of Dentistry and Pharmacy	BPharm	Pharmaceutical sciences	177	5	M/F
27	Mohammad Al Mana College of Health Sciences	BPharm	Pharmacy	177	5	M/F
28	Al Faisal University	PharmD	PharmD	198	6	M/F
29	Al-Rayan College	PharmD	Clinical Pharmacy	178	6	M/F
30	Hafar Al-Batin University	PharmD	PharmD	-	6	M/F

Abbreviations: Male (M), Female (F), Bachelor's degree in pharmacy (BPharm), Doctor of pharmacy (PharmD),

The BPharm integrates more pharmaceutical science courses such as medicinal chemistry, pharmacology, pharmaceutics and pharmacognosy with little emphasis on direct patient care course work, while the PharmD is rich with pharmacy practice and clinical pharmacy-oriented didactic courses such as therapeutics, patient assessment and medication therapy management (Al-jedai et al., 2016; Badreldin et al., 2020). Both programmes require students to complete an introductory pharmacy practice experience (IPPE) in one-semester summer training in hospitals and if possible in community pharmacies and pharmaceutical industries. PharmD students are required to complete an additional year of clinical rotation as

^{*}Sources: (Alkhateeb et al., 2018; colleges' websites)

advanced pharmacy practice experience (APPE). Each APPE is of 4 to 6 weeks duration where students are exposed to real-world scenarios, mainly as structured clinical rotations in hospitals, to gain skills required for pharmaceutical care practice such as communication skills, interprofessional collaboration and decision-making skills (Asiri, 2011; Aljadhey, 2012; Badreldin et al., 2020). The duration of these structured rotations varies among different schools as there are no unified APPE standards but usually ranges from 40 to 50 weeks (Badreldin et al., 2020).

It has been suggested that the differences in the programmes across all schools, i.e. programme names, credit hours, and training experiences, are due to the lack of standardisation of the curriculum at a national level to meet the requirements of the accreditation body, for instance, the NCAAA (Almeman and Al-jedai, 2016; Alhamoudi and Alnattah, 2018). Importantly, most pharmacy schools appear to follow a traditional knowledge-based curriculum with no specific reference to minimum competencies by the NCAAA, the national accrediting institute for higher education in Saudi Arabia or by the SCFHS, the registration body for all healthcare professionals in the country (Kheir et al., 2008).

Of note, most pharmacy schools' curricula focus on learning hospital and bedside pharmaceutical practice with little emphasis on learning community pharmacy practice. Although many of these schools have adopted their PharmD curricula from international schools, community pharmacy as a specific course is still missing in their curricula and if it exists, it might be one or two courses only throughout their study years (Alaqeel and Abanmy, 2015; Alhamoudi and Alnattah, 2018; Balkhi et al., 2020). Some schools also may not offer community pharmacy training to their students before graduation and when offered, it is limited to filling prescriptions with no opportunities for medication counselling or other community pharmacy services (Al-Arifi, 2012; Alaqeel and Abanmy, 2015; Balkhi et al., 2020). One study identified insufficient knowledge about community pharmacy during school years as one of the major reasons for the graduates' negative perception of working in community pharmacy. Around 53% of the study population did not have a clear

understanding of community pharmacy as a career option as the curricula did not include courses, rotations or internships in this area of practice (Balkhi et al., 2020).

Moreover, there seems to be some similarity in the curricular content across Saudi pharmacy schools (Almeman and Al-jedai, 2016). The main reason for this maybe that other Saudi pharmacy schools are following the curriculum of the College of Pharmacy-KSU as it is considered a good example and first one established (Asiri, 2011). It is likely, therefore, that there are no significant differences in the curricular clinical orientation or general content between programmes that offer PharmD or BPharm in Saudi Arabia. This is supported by the evidence from Aljadhey et al (2017), which cited the lack of expertise in curriculum design and evaluation as one of the main challenges facing the design and outcomes of pharmacy education curricula in Saudi Arabia.

2.6.3.8.4 Accreditation

Pharmacy schools in Saudi Arabia seek accreditation from different accrediting bodies at the national and international levels. At the national level, the NCAAA undertakes the responsibility to assure the quality of higher education through the application of a common set of national standards across different disciplines (Darandari et al., 2009; National Center for Academic Accreditation and Evaluation, 2022b). At the international level, there are various bodies responsible for accrediting pharmacy programmes, such as the ACPE in the United States and the Canadian Council for Accreditation of Pharmacy Programmes (CCAPP); there are also those which are responsible for accrediting health sciences programmes in general, such as the German Accreditation Agency in Health and Social Sciences (AHPGS). Table 2.5 illustrates accreditation status of pharmacy schools in Saudi Arabia.

Table 2.5: National and international accreditation status of pharmacy schools in Saudi Arabia

No.	University/College Name	Accreditation/Certificate	
1	King Saud University	N: NCAAA (conditional)	
	,	I: ACPE	
		I: CCAPP (expired in June 2017)	
2	King Abdulaziz University	N: None	
	,	I: CCAPP (from 2017-2023)	
3	King Khalid University	None	
4	King Faisal University	N: NCAAA (full)	
		I: ACPE	
		I: CCAPP (from 2018 -2023)	
5	Qassim University-Buraydah	N: NCAAA (full)	
		I: ACPE	
6	Qassim University-Unaizah	None	
7	Taibah University	None	
8	Taif University	N: NCAAA (full)	
9	Umm Al-Qura University	N: None	
		I: AHPGS	
10	Jouf University	None	
11	Najran University	None	
12	Princess Nora University	N: NCAAA (conditional)	
13	Sattam bin Abdulaziz University	N: None	
		I: ACPE	
14	Jazan University	None	
15	King Saud bin Abdulaziz University for Health	N: NCAAA (full)	
	Sciences		
16	Northern Borders University	None	
17	Shaqra University	None	
18	Albaha University	None	
19	Hail University	I: AHPGS	
20	Immam abdulrhamn bin Faisal University	N: NCAAA (conditional)	
21	University of Tabuk	None	
22	Riyadh Elm University	N: NCAAA (full)	
		I: None	
23	Ibn Sina National College for Medical Studies	N: NCAAA (full)	
		I: None	
24	Almaarefa Colleges for Sciences and	None	
	Technology		
25	Batterjee Medical College	I: ACPE	
26	Buraydah Colleges	None	
27	Mohammad Al Mana College of Health	None	
	Sciences	1	
28	Al Faisal University	None	
29	Al-Rayan College	None	
30	Hafar Al-Batin University	None	

Sources: (NCAAA, 2022; ACPE, 2022; CCAPP, 2022; AHPGS, 2022)

Abbreviations: National accreditation (N), International accreditation/certificate (I), National Commission for Academic Accreditation and Assessment (NCAAA), American Council of Pharmacy Education (ACPE), Canadian Council for Accreditation of Pharmacy Programs (CCAPP), German Accreditation Agency in Health and Social Sciences (AHPGS).

There seems to be slow movement from pharmacy schools in Saudi Arabia towards obtaining accreditation. Since the establishment of the NCAAA in 2003, Ibn Sina National College for Medical Studies, a private pharmacy school, was the first to obtain national accreditation from the NCAAA in 2016, while the Pharmacy School of Qassim University was the first public pharmacy school to obtain national accreditation from the NCAAA in 2018 (National Center for Academic Accreditation and Evaluation, 2022a). This slow progress raises questions about the quality and the outcome of the educational programmes (Almeman and Al-jedai, 2016; Aljadhey et al., 2017; Alhamoudi and Alnattah, 2018). Local research cited the dramatic increase in new pharmacy schools in the past two decades as the main reason for colleges' slow movement towards accreditation (Alhamoudi and Alnattah, 2018).

However, programme accreditation is not a prerequisite for pharmacist registration by the SCFHS (Saudi Comission for Health Specialities, 2014). That is, the student is not required to study an accredited programme to apply for a practice licence on graduation unlike in other countries, such as the United States and the United Kingdom, in which accreditation is essential to qualify the students for licensure (Fathelrahman and Rouse, 2018).

In 2015, however, the NCAAA published specific learning outcomes for some professional programmes including pharmacy (National Commission for Academic Accreditation & Assessment, 2015). The pharmacy learning outcomes were prepared through the contribution of academic professionals from selected universities, followed by consultation with international experts to follow international accreditation standards to meet best practices to fit Saudi Arabian requirements. Interestingly, given that learning outcomes are often used as a tool to measure how well students demonstrate a particular competency (Albanese et al., 2008; Kennedy et al., 2009), NCAAA provided a detailed description of learning outcomes for both PharmD and BPharm with no competencies identified (National Commission for Academic Accreditation & Assessment, 2015).

2.6.3.8.5 Challenges for pharmacy education

There are multiple challenges for pharmacy education in Saudi Arabia, for instance, the continuing nationwide shortage of qualified faculty members and teaching practitioners with appropriate education and training (Al-jedai et al., 2016; Almeman and Al-jedai, 2016; Aljadhey et al., 2017; Badreldin et al., 2020). The geographical distribution of faculty members and teaching practitioners with such expertise across the schools is also unequal (Almeman and Al-jedai, 2016). The scarcity of faculty with a clinical background has led some schools to recruit non-clinical faculty or physicians with a clinical pharmacology background to teach clinical pharmacy-related courses such as therapeutics. This might not only have affected the quality of the educational outcomes but also influenced the pharmaceutical practice of those graduates (Almeman and Al-jedai, 2016).

Another challenge is the limited number of training sites across the country. Many schools lack affiliation with pharmaceutical institutions, especially those with well-rounded clinical preceptors and advanced practice sites for appropriate learning experiences for students (Almeman and Al-jedai, 2016; Al-jedai et al., 2016; Badreldin et al., 2020).

Another reported issue is the lack of clear, unified, measurable outcomes that reflect the pharmacy practice needs required by graduates at a national level (Aljadhey et al., 2017). Thus, there has been a call for national competencies that describe the minimum acceptable level of quality educational outcomes to advance pharmacy education in Saudi Arabia (Almeman and Al-jedai, 2016; Aljadhey et al., 2017; Badreldin et al., 2020; Fathelrahman et al., 2022). Fathelrahman et al (2022) described that such competencies would not only allow the comparability of educational outcomes among the different schools but would enable "equity" of pharmaceutical care through the provision of standardised care across the country, "quality" through the provision of best pharmaceutical care and "economy" through the rational and collaborative use of available resources. It could be also argued that the minimum standard of competencies required for competency-based education will equip graduates and support practitioners with the competencies to

meet evolving healthcare requirements as well as the healthcare needs of society and national health (Anderson et al., 2008; Frenk et al., 2010; Anderson et al., 2012; Katoue and Schwinghammer, 2018). Therefore, a broad spectrum of major stakeholders responsible for either the practice or education of pharmacists should collaborate in developing a profession-wide competency framework that applies to all pharmacists across different regions and settings of practice in Saudi Arabia (Aljadhey et al., 2017; Fathelrahman et al., 2022).

2.7 Rationale for the study

The literature review suggested that there is inconsistency in pharmacy practice and education in Saudi Arabia.

From a practice perspective, there is an overall shortage of Saudi pharmacists, domination of private pharmacy sectors by non-Saudi pharmacists and inequality of workforce distribution across different geographical areas, specialities and practice sites (Ministry of Health, 2020). Furthermore, there is inconsistency in the level of pharmacy practice between the hospital setting and community pharmacies, the government and private sectors and between large and small hospitals (Al-jedai et al., 2016; Almaghaslah et al., 2018; AlRuthia et al., 2018a). The various educational backgrounds, skills and expertise of the workforce may cause varying performance as most pharmacists are non-Saudi.

From an education perspective, 29 public and private schools have been established since 2001 bringing the total number of pharmacy schools currently to 30. While the growth that serves a need is healthy, it is concerning that this expansion may happen at the expense of the quality of graduates, particularly in the absence of evidence regarding the structure and outcomes of educational programmes (DiPiro, 2003). There is a lack of evidence regarding the capability of schools, both new and existing, to provide appropriate high-quality instruction, as well as the approaches schools use to maintain quality as they grow, especially since almost half of schools have not yet been accredited. There is also a lack of evidence about schools' adequacy of resources, faculty qualifications, continuous curriculum assessment, students' professional development and achievement of competencies through didactic and experiential components of the curriculum. Moreover, there is no national competency framework for pharmacists in any sector or stage of practice. In the absence of such core quality elements to inform pharmacy education assessment and development, the extent to which pharmacy schools in Saudi Arabia prepare competent pharmacists to address societal needs is unclear.

It has been suggested that to improve the ultimate benefits of patients and civil society as well as the overall national health, the education of new Saudi professionals must develop a competent pharmaceutical workforce equipped with the required competencies that meet healthcare needs (Anderson et al., 2008; Frenk et al., 2010; Anderson et al., 2012; Katoue and Schwinghammer, 2018). The country's policy reforms requires new graduates to fill the positions of the foreign workforce in the private health sector (Saudi Vision 2030, 2017). The recent transformation of the pharmacy model of practice from inpatient pharmaceutical care in hospitals to ambulatory pharmaceutical care in community pharmacy (Alomi, 2017) requires pharmacy education in Saudi Arabia to satisfy the government plans and support pharmacists in developing their competencies to fulfil their current and expected roles. Nonetheless, it is crucial to identify the competencies required for pharmacy graduates to prepare them to work efficiently and effectively in the rapidly evolving healthcare system and to commit and deliver the range of current and new pharmaceutical services as appropriate to the country's needs from pharmacists. Therefore, evaluation of curricula instruction and outcomes is crucial to ensure the quality of educational programmes to produce graduates equipped with needs-based competencies.

2.8 Research questions (RQs)

Based on the review of the literature relevant to the status of pharmacy education to prepare competent pharmacists in Saudi Arabia, three research questions were formulated:

- RQ1: What are the country's needs for qualified pharmacists and pharmaceutical services?
- RQ2: What are the competencies considered essential for pharmacists to address the required healthcare needs and pharmaceutical services in Saudi Arabia?
- RQ3: To what extent is Saudi pharmacy education able to prepare qualified pharmacists equipped with the required competencies to address the required healthcare needs?

2.9 Aim and objectives

To answer the research questions, this research project aimed to explore the extent to which pharmacy education can prepare competent pharmacists to address the healthcare needs for pharmacy practice in Saudi Arabia. The research, therefore, adopted the FIP needs-based education model to achieve the following objectives (Figure 2.5):

- 1. To explore healthcare needs that can benefit from pharmacists' care in Saudi Arabia and the required roles of pharmacists to meet these needs.
- To identify and describe competencies considered essential for the effective performance of pharmacists within all sectors of practice in Saudi Arabia to develop a proposed profession-wide national competency framework for pharmacists.
- To assess the extent to which the current pharmacy programme in Saudi Arabia meets the identified competencies of the proposed national competency framework.

Table 2.6 illustrates the research questions, objectives and studies undertaken to address the aim of this research.

Table 2.6: List of research questions, objectives and studies used to address the objectives of the research project

Research questionObjectiveStudyChapter numlRQ1: What are the country's needs for qualified pharmacists and pharmaceuticalTo explore healthcare needs that can benefit from pharmacists' care in Saudi ArabiaPhase 1: Healthcare and pharmacy needs assessment- a semi- structured interviews	
country's needs for qualified pharmacists from pharmacists' and pharmaceutical care in Saudi Arabia and pharmacy needs assessment- a semistructured interviews	
qualified pharmacists from pharmacists' assessment- a semi- and pharmaceutical care in Saudi Arabia structured interviews	
services? and the required roles and focus groups of	
of pharmacists to pharmacy	
meet these needs. stakeholders to	
explore the local	
health care needs that	
can benefit from	
pharmacists' care and	
the required roles of	
pharmacists to meet	
these needs.	
RQ2: What are the	5
competencies describe Competencies	
considered essential competencies identification- a survey	
for pharmacists to considered essential of pharmacists to	
address the required for the effective assess their perception	
healthcare needs and performance of of the relevance of the	
pharmaceutical pharmacists within all International	
services in Saudi sectors of practice in Pharmaceutical	
Arabia Saudi Arabia in order Federation (FIP)	
to develop a proposed Global Competency	
profession wide Framework (GbCF v1)	
national competency to their practice framework for	
pharmacists Phase 2b: National	
competency	
framework	
development- a	
consensus	
development panel of	
pharmacy experts to	
develop consensus on	
a proposed profession-	
wide national	
competency	
framework.	
RQ3: To what extent is To assess the extent Phase 3: Education Chapter	. 6
RQ3: To what extent is To assess the extent Phase 3: Education Chapter Saudi pharmacy to which the current assessment- a case	U
education able to pharmacy programme study mapping two	
prepare qualified in Saudi Arabia meet selected	
pharmacists equipped the identified undergraduate	
with the required competencies of the pharmacy curricula	
competencies to proposed national against the identified	
address the required competency competencies of the	
healthcare needs? framework proposed national competency	

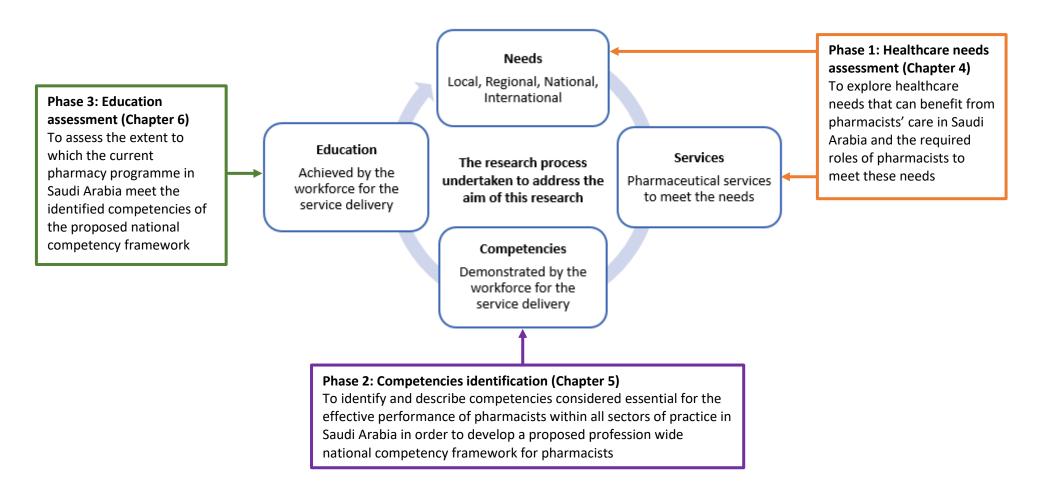


Figure 2.5: The research process undertaken to address the aim of this research. The process adopted from the FIP needs-based education model (International Pharmaceutical Federation, 2017)

Chapter 3: Methodology and methods

3.1 Introduction

In this chapter, I will explain the methodological approach adopted for this research by briefly outlining the philosophy underpinning the research topic and the rationale for using mixed methods. Then, I will describe the researcher's subjectivity and reflexivity and outline the research rigour and ethics, as well as providing a brief description of the qualitative and quantitative research methods used in this study. Details of how each method was employed in data collection and analysis at each phase of the study are described in the corresponding chapters.

3.2 Philosophical paradigm underpinning this research

This research aimed to explore the extent to which the current Saudi pharmacy education can prepare competent pharmacists to address healthcare needs in Saudi Arabia. To achieve this aim, an understanding of societal healthcare needs, pharmacists' roles, core competencies and curricular core quality elements within the local context of Saudi Arabia is required.

Historically, health science researchers almost exclusively used a quantitative or positivist paradigm, considered to be the gold standard method for unbiased, objective inquiry. In the positivist paradigm, the researcher is considered independent and has to test reality in an objective and unbiased way (Doyle et al., 2009). Qualitative researchers, take a constructivist stance, believing that there are no free context realities and that the research and the researched cannot be separated. However, both schools agree that combing quantitative and qualitative methods is inappropriate due to the fundamental differences in the underlying paradigm (Guba and Lincoln, 1994). Howe (1988) rejected this incompatibility and argued that quantitative and qualitative methods are compatible and can be combined in epistemology (nature of knowledge) or practice (study design). Therefore, mixed methodologist researchers positioned "pragmatism" as a new paradigm, resolving the debate about the contrasting paradigms and sitting midway

between positivism and constructivism (Howe, 1988; Tashakkori and Creswell, 2007; Morgan, 2007).

A pragmatism paradigm is less concerned about quantitative and qualitative counts, rather focusing on approaches that produce pragmatic solutions. Research philosophy is viewed as a continuum rather than an option that stands in opposite positions. In this philosophy, the objectivist and subjectivist perspectives are not believed to be mutually exclusive (Wahyuni, 2012). It draws on employing "what works" using diverse approaches, giving primacy to the importance of the research problem and question and valuing both objective and subjective knowledge rather than questions about the nature of research methods (Morgan, 2007). Pragmatism typically is synonymous with mixed methods and can be considered as the complementary philosophical partner of a mixed methods research approach (Creswell and Creswell, 2017). Pragmatism enables mixed methods researchers to adopt a pluralistic stance of gathering different datasets to better answer the research question rather than either approach alone (Creswell and Clark, 2017).

Being a pharmacist with a science background and embarking on research that is social in nature, I found my previous positivist preconceptions require shifting to better serve the new direction of my doctoral research. I found adopting pragmatism as a guiding research paradigm is compatible with the research aim and offered a methodological tool to support addressing the research questions. Taking a pragmatist position allowed me to emphasise the research question and use all available approaches and types of data to develop a deep social and contextual understanding of the current situation and future needs of pharmacy education in Saudi Arabia from multiple perspectives and data sources. Therefore, the knowledge of reality is dependent on the research question and employing "what works" is required to derive the knowledge about the research problem.

3.3 Mixed methods approach

Mixed methods research combines qualitative and quantitative approaches, techniques, concepts or methods into one study (Johnson and Onwuegbuzie, 2004).

Choosing and merging different methodologies allows researchers to develop the best possible method to answer a specific research question comprehensively (Creswell and Clark, 2017). It allows research questions to dictate the choice of research methods rather than an inclination towards a qualitative-only or quantitative-only research method (Hadi et al., 2013a). Creswell and Clark (2017) described mixed methods as "practical" as it gives the freedom to select among methods, allows the mixing of words and numbers and combines inductive and deductive reasoning.

Compared to a single study design, mixed methods research has several advantages. Combining qualitative and quantitative methods allows one to maximise the strengths of the two methodologies and minimises their respective limitations (Hadi et al., 2013a). It also allows collecting a more holistic account of a research topic leading to a richer understanding of researched phenomena. The use of different data sources collects a wider point of view, thereby stronger inferences. Mixing methods has the intrinsic advantage of greater validation or 'triangulation' of research findings due to increased depth, consistency and scope (Flick, 2018) as it allows methodological triangulation, within and between methods; and data triangulation, using different types of data (Bryman, 2016). Aronson (2013) argued that using mixed methods in social pharmacy research is a valuable tool, especially as such inquiries are usually multi-layered and not exclusively bound to a qualitative or quantitative count alone.

In this research, a comprehensive understanding of societal healthcare needs, pharmacists' roles and core competencies in Saudi Arabia is required to assess the extent to which current pharmacy education programmes are utilising a needs-based education approach to address the country's needs for pharmacists and pharmaceutical services. The strength of using a mixed method as a research approach for my social inquiry is that it starts with my research question to gather information on both subjective and objective realities.

The qualitative methods helped to explore societal healthcare needs and pharmacists' roles (phase 1, Chapter 4) and curricular core quality elements (phase 3, Chapter 6) using subjective data from stakeholders, institutions and documents. This provided the research with rich data within the local context of Saudi Arabia, in which the policies generated will be established and implemented. Qualitative methods used in my research project enabled me to collect information by talking to people in their context, thereby, learning the experiences and meanings that the participants hold about an issue, rather than the assumptions and meanings I brought to the research (Creswell and Clark, 2017). On the other hand, the quantitative methods helped to identify core competencies and measure variation in the characteristics and central pattern of pharmacists' practice and those competencies using objective data from surveys which can be then analysed statistically and generalised (phase 2a, Chapter 5). This provided the research with an overall picture of pharmacists' current practice in different practice settings in Saudi Arabia, of which there is limited data. Moreover, the mixed methods helped to develop a profession-wide consensus from the major stakeholders in practice and education on the FIP GbCF v2 to the Saudi practice environment (Phase 2b Chapter 5) using a hybrid of methods where subjective data from experts were analysed and synthesised statistically. This enabled me to develop consensus about competencies required for effective performance from different areas of practice, thereby developing a unique profession-wide framework fit for purpose and relevant to all pharmacists in the Saudi pharmacy practice context.

The intentional use of qualitative, quantitative and mixed methods in this research is because neither qualitative nor quantitative methods alone are enough to capture the social inquiry of interest. The use of those methods enhanced the strengths of each to address the research question from multiple perspectives through the systematic collection of informants' perspectives on healthcare and pharmacy needs, pharmacists' roles, core competencies and quality of current education providing valuable information to inform the research process and findings (Hadi et al., 2013a). Combining approaches provided the opportunity to

compare and integrate data collected through different methods adding more validity and credibility to the study findings (Bryman, 2016).

3.3.1 The exploratory sequential mixed methods design

Research designs are the procedures undertaken to collect, analyse, interpret and report data in studies (Creswell and Creswell, 2017). Within a mixed methods approach, these designs are used to assist the researchers in designing the level of interaction between the qualitative and the quantitative components, the weighting given to each component, the timing to collect the data and use the results, and the point(s) where both components are integrated (Creswell and Creswell, 2017). There are various classifications or typologies of mixed methods research designs, yet the research question and the rationale for selection should guide the researchers when selecting their mixed methods design (Hadi et al., 2013a). In pharmacy practice research, there are four basic mixed methods designs commonly used (Creswell and Clark, 2017; Hadi et al., 2013a): the convergent (or triangulation) design, the explanatory design, the exploratory design and the embedded design.

To address the aim and objectives of this research, I chose to use an exploratory sequential mixed methods research design. This design best suits studies that aim to develop a complete understanding of the research topic by obtaining different but complementary data on the same topic, triangulating the findings for confirmation and validation and developing a comprehensive understanding of the research issue (Hadi et al., 2013a). The classic exploratory sequential design begins with, and typically prioritises, the collection and analysis of qualitative data to explore a phenomenon in the first phase followed by a development phase (or intermediate phase) of translating the qualitative findings into a tool or approach that is tested quantitatively in the third phase (Creswell and Clark, 2017). As every phase of this study aims to inform the following phase, a variation from the classic exploratory sequential design was applied to the intermediate phase. Instead of using the qualitative findings from phase 1 to develop an approach or a tool in phase 2a, an existing validated and evidence-based tool, i.e., the FIP GbCF version 1

(v1) was used to identify pharmacists' competencies in all practice settings and measure the relevance of this framework within the Saudi context. This informed the development of a national competency framework in phase 2b which consequently was used as a template for the curriculum mapping process in phase 3. Adopting this design helped to apply the FIP needs-based education model to the Saudi context whereby three consecutive phases were designed to develop a comprehensive understanding of the status of Saudi pharmacy education overall and assess the ability of educational programmes to qualify graduates with needs-based competencies to fulfil the required roles. Perhaps most importantly, adopting such methodology to apply the FIP needs-based educational model was helpful to identify unknown but important country-specific variables effectively, namely societal healthcare needs, pharmaceutical services needs, competencies required for effective professional performance and quality of current initial education programmes.

Using this design, I collected qualitative and quantitative data sets independently in three phases composed of four studies following the traditional techniques associated with each type of data, shown in Figure 3.1.

- In the first phase, I used qualitative methods, i.e. individual interviews and focus groups, to explore the perceptions of pharmacy professionals and the public regarding healthcare needs that can benefit from pharmacists' care and the required roles of pharmacists to meet these needs in Saudi Arabia. This phase aimed to develop an in-depth understanding of societal health information that reflects the local context.
- In the second phase, I used two methods, quantitative and mixed methods, to identify competencies required to establish a national competency framework: a national cross-sectional survey to investigate the relevance of the FIP GbCF v1 to the practice of pharmacists in Saudi Arabia followed by a nominal group technique to establish a profession-wide consensus on the

list of the FIP GbCF v2 competencies. This phase aimed to develop a proposed national competency framework for pharmacists in Saudi Arabia.

• In the third phase, I utilised qualitative methods, i.e., curriculum mapping, framework analysis and content analysis to map and evaluate selected undergraduate curricula against the identified competencies of the proposed national competency framework. This aimed to assess the extent to which the current pharmacy programme meets the national competency framework thereby providing an overall reflection of the status of pharmacy education in Saudi Arabia.

After each study data collection, I analysed each dataset separately before triangulating the findings from the four studies for confirmation and validation, which enabled me to develop a comprehensive and broader understanding of the research problem.

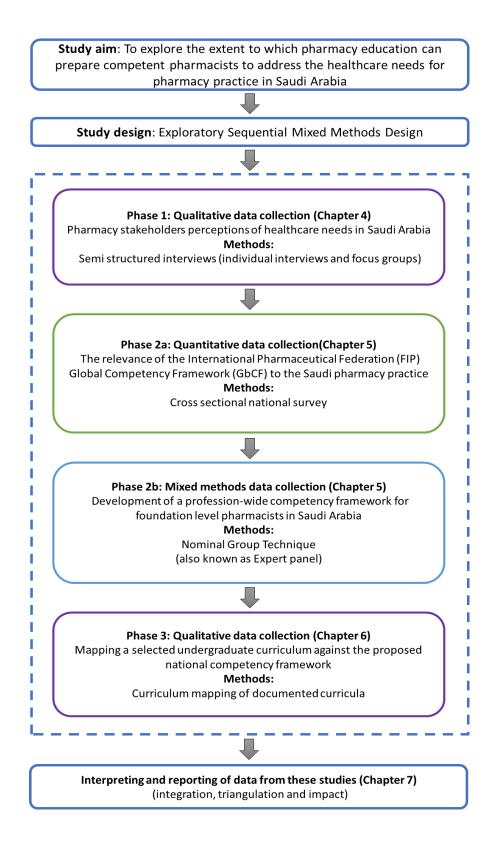


Figure 3.1: The research design of this PhD study

In this research, I utilised both methodological and data triangulation to validate the findings about the status of pharmacy education in Saudi Arabia. In methodological triangulation, the qualitative methods (interviews, focus groups and document analysis), quantitative methods (survey) and mixed methods (nominal group technique) were combined. Data triangulation uses various data sources including findings from interviews, focus groups, surveys, nominal group technique and data from educational curricula to complement each other. The triangulation approaches used in this research were to compare, complement, confirm and contrast data and findings from all four studies to strengthen recommendations and conclusions.

The use of this variant sequential mixed methods design provided each component with the required priority one at a time and maintained the scope of each methodology. It had the advantages of making both implementation and reporting of the phases quite straightforward. However, considerable time and resources were required to implement this design and to collect and analyse data from both qualitative and qualitative resources. When triangulating the findings, there were moments where contradictory data existed. Nevertheless, the ability to explore such contradictions in social phenomena is one of the prime benefits of mixed methods research (O'cathain et al., 2008) and these contradictions, and how I resolved them, are described in in the final discussion chapter (Chapter 7).

3.4 Research methods

This section will discuss the research methods adopted in this study.

3.4.1 Qualitative research methods

Qualitative research aims to understand a research problem from the perspectives of the people it involves (Mack, 2005). It is effective in obtaining intangible factors of a particular population such as opinions, behaviours, values, experiences and social contexts and analyse them. The main characteristic of qualitative research is that it does not seek to generalise findings to a wider population, rather, it aims to clarify the thoughts and feelings of study participants and interpret their

experiences to provide an exploration or an explanation for the phenomena of interest in a given context (Austin and Sutton, 2014). Qualitative research uses various methods of data collection such as interviews, observation, document analysis, etc., each of which has its application, strengths and weaknesses. The choice of method is dependent on the research question, accessibility and feasibility of data collection from potential participants as well as the time and resources available.

There is very little information about healthcare needs and pharmacists' roles in Saudi Arabia. Therefore, qualitative research methods were ideal to explore this topic because it allowed capturing the perceptions of public and stakeholders about healthcare needs as well as current and potential roles for pharmacists in the Saudi context. Such methods are well suited to provide an in-depth understanding of society's healthcare and pharmacy needs and other perspectives related to pharmacy education where the data is related to the social world and cannot be quantified. In this section, the focus will be on the methods used in this research, namely interviews (both individual and focus groups) and curriculum mapping.

3.4.1.1 Interviews

In qualitative research, there are two types of interviews: individual interviews and focus groups, both of which have been used in exploratory and descriptive studies and are commonly used in pharmacy practice research (Austin and Sutton, 2014). The choice of data collection is based on the appropriateness of the method to answer the research question and the challenges associated with each method. For pragmatic reasons, both methods were used in the phase 1 study to address the research question: What are the societal needs for healthcare, qualified pharmacists and pharmaceutical services? Although a range of methods has been used to identify societal healthcare needs, there is no consensus approach since different topics typically require different approaches (Wright et al., 1998; Haughey, 2008; Williams et al., 2000). This may involve a combination of qualitative and quantitative methods to collect original data or transferring and adapting what is already available (Wright et al., 1998). Importantly, the method used should reflect

the aim, functions and resources of the assessment process (Billings, 1996) and determine priorities for the most effective use of resources balancing the ethical, clinical and economic aspects of needs (Wright et al., 1998).

In phase 1 study, a qualitative healthcare needs assessment approach, comprising of individual interviews and focus groups, was found appropriate to develop a comprehensive understanding of different perspectives from relevant stakeholders about the required needs of pharmaceutical services in the Saudi context. Both methods were found appropriate to collect rich and deep information effectively about societal healthcare needs from the different group of stakeholders where reality is socially constructed and based on past and current interactions and experiences with the healthcare system and its services. More details about these methods are provided in the following section.

3.4.1.1.1 Semi structured interviews

There are three types of individual interviews: structured, unstructured and semistructured.

Structured interviews are commonly used in quantitative research where a list of predetermined questions is framed algorithmically to guide the interviewer. It has the advantage of facilitating consistency between participants, yet it resists spontaneity and limits flexibility for and by the researcher (Austin and Sutton, 2014). In unstructured interviews, the researcher might have a single question to guide the interview direction towards the research topic, then the interviewee is allowed to respond freely while the researcher is simply responding to the points worthy of follow-up (Bryman, 2016). The information obtained from this type of interview is frequently more sensitive, rich and has more depth than data collected in other types of interviews. However, this method has a risk of bias and is expensive, time-consuming, and complex to collect and analyse, thus it is practical for small samples only (Bowling, 2014).

Semi-structured interviews are the hybrid format of the other two types of interviews, providing more opportunity for the participants to respond (as in the unstructured interviews) yet maintaining some structure to compare responses from other participants (as in the structured interviews). Semi-structured interviews are used when there are precise questions and more specific data is required (Bowling, 2014). In this approach, the interviewer has a list of questions, referred to as the interview guide (Bryman, 2016), but still has the flexibility to adapt questions based on the direction of the participant's responses allowing for a more natural and intuitive conversation between interviewer and participants (Edwards and Holland, 2013; Austin and Sutton, 2014). The researcher may ask questions in no specific order, dependent on the interview progress and the interviewee's responses, and pick up questions on interviewee replies and use prompts to provide more insights (Bryman, 2016).

In phase 1 of this research (Chapter 4), I used semi-structured interviews with the professional group participants, i.e. policymakers and pharmacists, as they were more suitable to obtain a rich and depth understanding of the individual's perceptions about healthcare and pharmacy needs. Being busy individuals, it also allowed flexibility to arrange a convenient time and place for participants based on their work schedule. It also provided the respondents confidentiality, thereby encouraging them to share their true opinions and minimising the influence, pressure or dominance of one peer over the others.

Details of the interview guide and its development is discussed in Chapter 4.

3.4.1.1.2 Focus groups

In focus groups, the researcher collects data from multiple participants at the same time in an unstructured but guided discussion focused on a topic of interest (Braun and Clarke, 2013). It has become an increasingly popular method of data collection in qualitative research as the interaction between participants in an open supportive environment can result in in-depth, elaborated and detailed accounts of the investigated topic (Wilkinson, 1998a; Wilkinson, 1998b). Perhaps one of the

important advantages of focus groups is that they allow for a wide range of views, perspectives or understandings to be elicited regarding under-researched topics because prior knowledge about the topic is not required (Wilkinson, 1998a; Braun and Clarke, 2013). They are also useful for exploring cultural values and beliefs about population health and disease in a specific context (Bowling, 2014).

Compared to individual interviews, focus groups are less expensive and time-consuming for data collection, but do have some limitations. They are prone to social desirability bias because some participants may report good behaviours or experiences to please the interviewer. The opinion of dominant over reluctant participants may also skew the study findings. Some responses might not be provided in group discussions compared to individual interviews because some participants may not feel comfortable to discuss some issues in a group setting. Another limitation to this method is the time consumed in participant recruitment and logistics such as finding an appropriate time and venue for all participants as well as the time consuming data transcribing and analysis (Bryman, 2016).

In phase 1 of this research, I used focus groups to conduct interviews with the public to explore their perspectives and views about healthcare needs that can benefit from pharmacists' care in Saudi Arabia. It was used to explore the public participants' views and understandings about a topic that is common to the participants involved. With the public participants, the interaction taking place within focus groups was found to generate a considerable amount of interactive and interpersonal data regarding healthcare needs in the Saudi context, which might not have been revealed in individual interviews (Bryman, 2016). In addition, conducting focus groups was considered an ideal effective approach to collect detailed information from a large number of participants from different geographic locations within the limited allocated time and resources for the study.

Details of the focus group interview guide and its development is discussed in Chapter 4.

3.4.1.2 Documentary evidence

Textual documents which provide information can be employed in social research (Bryman, 2016). Analysing data in such resources can have a quantification (or quantitative) or an interpretation (qualitative) emphasis, therefore, depending on the research question, data available in documentary evidence can be used both qualitatively and quantitatively (Kohlbacher, 2006).

With qualitative emphasis, documents can be examined and interpreted to elicit meanings, gain understanding and develop empirical knowledge similar to qualitative research methods (Strauss and Corbin, 2008). Documents can include personal documents such as diaries; official documents from states or private sources, such as public inquiries; or documents produced from organisations or mass media such as newspapers (Bryman, 2016). As a qualitative research method, analysing documentary evidence is applicable, particularly to qualitative case studies, which is an intensive type of study that produces a rich description of a single phenomenon, programme, organisation or event (Stake, 1995; Yin, 2009). Qualitative content analysis is one of the common approaches to analysing documentary evidence.

Documentary evidence has several advantages (Bowen, 2009): it is cost-effective because the data is already gathered and contained in the documents. It is also more efficient and less time-consuming as it requires data selection instead of data collection. However, there are inherent limitations in documents, such as insufficient details as they were produced for reasons other than research, or documents might not be retrievable or accessible. Moreover, an incomplete collection of documents suggests selection bias because, in organisational contexts, available documents are more likely to be aligned with the organisations' principles or depend upon the department responsible for document keeping for completeness and organisation (Yin, 2009).

As the educational programme in pharmacy education is delivered through a curriculum, analysis of documented curricula from pharmacy schools in Saudi Arabia

was appropriate to address the research question: To what extent is current Saudi pharmacy educational programmes meet the proposed national competency framework? In phase 3 of this research, I used documented curricula as the means to provide the basic inputs for educational programmes analysis, in order to assess the extent to which curricular content is aligned with the proposed competency framework (Kelley et al., 2008). The following section provides more details about this curriculum mapping as the methodological approach adopted.

3.4.1.2.1 Curriculum mapping

A curriculum map is the visual representation of components and characteristics within, or between, different curricula (Greatorex et al., 2019). Curriculum mapping refers to the method for creating and using curricular maps to demonstrate the links or relationships between different concepts of curriculum diagrammatically, such as content, learning outcomes, learning resources etc. allowing easier review and potential comparisons (Harden, 2001; Abate et al., 2003; Greatorex et al., 2019). They are usually presented as charts, graphs, tables, networks and other graphical representations and provides what is taught (learning objectives and course content), when it is taught (timetabling and sequencing), how it is taught (teaching methods and learning opportunities), and what is learned (learning outcomes and student assessment) to explain students' achievement of expected learning outcomes (Harden, 2001). Analysing of what is displayed transparently can facilitate a deep understanding of curricula progress and can be used as a tool to assess and develop curricula (Burwash et al., 2016; Ervin et al., 2013).

In phase 3 of this research, I mapped the curricula against the developed competency framework to assess the alignment between them, including identifying gaps and inconsistencies between current educational curricula and the competencies considered essential for effective professional performance of pharmacy in Saudi Arabia. Visualisation of the linkages between the developed competency framework and the sampled curricula facilitated a deeper understanding of curricula emphasis on competencies and how current curricula contribute to students' progress towards achievement of competencies. Curricular

mapping also was a useful tool for providing a comprehensive understanding of the subjective data of the curricula content and presenting it as objective data and maps that provided clear insights into the strengths and weaknesses of the sampled curricula, consequently offering opportunities to improve the quality of education in Saudi Arabia.

It is important to mention here that the scope of educational curricula in undergraduate pharmacy education is often different from the scope of the foundation-level pharmacy competency framework. Undergraduate pharmacy education curricula often qualify graduates with competencies required for entry-level practice (i.e. day one of registration) whereas the proposed competency framework qualify pharmacists with competencies required for effective foundation level practice (beyond day one of registration and up to 2-3 years of practice). Therefore, the curricula assessment conducted in phase 3 of the study was not to assess whether the sampled curricula fully meet the proposed competency framework but rather to identify any competency gaps between the sampled curricula and the competency framework and assess whether changes for optimising curricula or CPD activities are necessary.

3.4.1.3 Sampling and sample size

Qualitative research often uses non-probability sampling to select the study participants based on specific characteristics within the sampled population in a strategic way so that those sampled are relevant and appropriate to the research question (Bryman, 2016). Non-probability sampling is not intended to be statistically representative nor to generalize its findings to a population but to provide an appropriate sample with an adequate amount of data to fully analyse the topic of interest and address the research question (Braun and Clarke, 2013).

In phase 1, purposive, snowballing and convenient sampling approaches were ideal to obtain an in-depth understanding of the participants' perceptions of societal healthcare needs and related factors within the studied context. The combination of these approaches helped to collect data from the relevant stakeholders based on

the specific categories suggested by the FIP for pharmacy education quality assurance (International Pharmaceutical Federation, 2014) to ensure a broad spectrum and fair representation of major stakeholders within pharmacy education and practice.

Identifying an appropriate sample number for phase 1 in advance was difficult especially since there are no rules in which specify this qualitative inquiry (Patton, 2002). Regarding individual interviews, Braun and Clarke (2013) suggest 15-30 individual interviews are common for identifying patterns in qualitative research and Warren (2002) regrades 20-30 interviews as the minimum number of interviews for the publication of qualitative research.

In focus groups, however, it is unlikely that one group will meet the researcher needs due to the possibility of answers to be particular to that group. On the other hand, too many groups will be a waste of time. However, there is a common tendency of groups to range between 8-15 in literature (Bryman, 2016). How large the group should be? Morgan et al (1998) suggests that the group should comprise between 6-10 members. Peek and Fothergill (2009) argue that a small group of 3-5 was more manageable. Patton (2002) and Morse (2004) also suggested that the researcher should consider what data will be useful, the quality of data, the scope of the study, the purpose of the inquiry, the amount of useful information, the available time and resources and what will have credibility.

Guest et al (2006) argued that data saturation, in which no new concepts emerged from the data collection, is the criterion to determine the size of a purposive sample in qualitative inquiry, whereas Josselson and Lieblich (2003) cautioned that real saturation may never occur as every respondent provides new insights. "Experiments" of data saturation suggested that 7 (Guest et al., 2006; Constantinou et al., 2017), 9 (Coenen et al., 2012), 12 (Ando et al., 2014) or 16 individual interviews (Hagaman and Wutich, 2017); and 3 (Guest et al., 2017) or 5 (Namey et al., 2016) focus groups can identify and understand themes, hence, achieve data saturation (Braun and Clarke, 2019). Saunders et al (2018) argued that data

saturation is a process rather than a point to achieve or a state when reporting the number of participants where saturation occurred. Saunders et al (2018) and Fusch and Ness (2015) encouraged researchers to demonstrate evidence for data saturation through the collection of sufficient data to represent the depth and breadth of phenomena which consequently will provide rich and insightful data analyses. I agree with Saunders et al (2018) that data saturation is a process rather than a point to achieve, therefore, data saturation did not guide the data collection process of the individual interviews or the focus groups. Rather, for pragmatic reasons, the supervisors and I sought to conduct 20-30 individual interviews and between 5-8 focus groups from five different provinces (see Chapter 4 section 4.4.2.2 for more details about sampling and selection of phase 1 participants) to collect sufficient data within the allowed time and resources to address the research aim.

In phase 2b, the aim of the study was to develop a profession-wide consensus from experts in practice and education on the appropriateness of the FIP GbCF v2 to Saudi pharmacy practice. Therefore, a purposive sampling was ideal to collect data from a group of experts in practice and education based on the specific categories suggested by the FIP for pharmacy education quality assurance (International Pharmaceutical Federation, 2014) to ensure a broad spectrum and fair representation of major stakeholders within pharmacy education and practice in this phase of the study.

In phase 3, there is no nationally agreed core curriculum in Saudi Arabia, therefore, the curricula of all pharmacy schools were eligible for inclusion in this study. As the aim of this phase was to provide more insights into national pharmacy programmes, a purposive sampling approach was adopted to select PharmD curricula from two different national schools to explore and capture the features and aspects of more than one local curriculum. The choice of the PharmD programme over BPharm in the curricular mapping process was because in Saudi Arabia PharmD is currently the dominant degree and most schools, if not all, have transformed or are in the process of transforming to PharmD. Therefore, the evaluation of two PharmD

curricula in this phase was appropriate to provide an overall reflection on the status of national pharmacy education in Saudi Arabia. This allowed making comparative content comparisons and identifying gaps between the two sampled curricula and provided more insights into the instructional content of both curricula in terms of similarities, differences, competency emphasis, relative trends, and weighting of the curricular subject domain with each other and against the proposed competency framework.

3.4.1.4 Data analysis

In general, qualitative analysis aims to develop analytical categories to describe and explain a social phenomenon (Braun and Clarke, 2013). An appropriate analysis approach is often selected based on the aim of the research and the depth of understanding required from the collected data.

In phase 1 (Chapter 4), thematic analysis was used to analyse the data from individual interviews and focus groups. Thematic analysis is a method for identifying patterns (themes) of meaning within data sets in relation to a research question. One of the main strengths of this method is its flexibility to answer any type of research question or data regardless of the sample size and methods of data collection (Braun and Clarke, 2013). The exploratory nature of phase 1 study derived the choice of thematic analysis as an approach to provide a rich thematic description of the entire dataset of what key informants perceived as healthcare needs. In the absence of empirical evidence or other information about societal healthcare needs in the Saudi context, adopting this approach was appropriate to explore the predominant or important themes. It also provided the advantage of analysing the data and identifying themes inductively, where the findings from this study were linked to the dataset directly rather than fitting data to a pre-existing coding frame or the researcher's analytic preconceptions, i.e., deductive analysis. This allowed the analysis to be generated from the data to reflect the studied context and not be shaped by an existing theory or framework.

In phase 3 (Chapter 6), Greatorex et al's (2019) stepwise curriculum mapping approach was used to analyse the data from the sampled curricula. While there are different methodological approaches to creating, using, analysing and comparing curricula, there is a scarcity of literature explaining replicable methods (Elliott, 2014). Therefore, this approach was chosen because it provides a systematic methodological six-stage approach to create a replicable curriculum map and focused comparisons of curricula using documentary evidence. It was appropriate to make the curriculum mapping process transparent thereby allowing others to draw conclusions and potentially replicate it. Using this stepwise approach also facilitated analysing the curricular content qualitatively and quantitatively to understand the different aspects of the selected curricula effectively and comprehensively. Combining these methods in this stepwise approach helped to address the research objectives by converting large unstructured qualitative data of the sampled curricula into manageable findings where characteristics and aspects of the two curricula were easily described and transparently represented in frequencies, tables and graphs. Consequently, this supported or refuted conclusions about the status of current local curricula content and helped formulate recommendations for education policymakers. This was conducted as follows (Greatorex et al., 2019):

- Defining the study aim and use: this phase of the study aimed to assess the
 extent to which local PharmD curricula meet the proposed foundation level
 pharmacy competency framework.
- Deciding what curricula will be considered: as educational programmes in higher education are often delivered through curricula, the intended curricula of the current PharmD programmes of two governmental pharmacy schools were purposively selected for assessment.
- Determining the key features of curriculum for the mapping process: the
 behavioural statements of the proposed competency framework were used
 to build a coding frame for the mapping process, the contact hours of each
 course were used for the weighting process and the PHARMacy Education IN
 Europe (PHARMINE) project guidelines (Atkinson, 2014) was used as a

- framework for categorising the curricular domains and courses as there is no local guideline to assist in the curricular categorisation process.
- Collecting relevant information and sources of data: the official curriculum documents from the school websites were accessed to collect the relevant data to establish data entry in the designed instruments.
- Extracting data and inputting into a standard instrument: the relevant curriculum documents were evaluated to record a response for each question in the standard instruments.
- Representing the consolidating findings: this stage involved compiling the collected data for representation.

3.4.2 Quantitative research methods

Quantitative research entails the collection of numerical data to exhibit the relationship between variables which then can be measured and analysed using statistical methods (Creswell and Creswell, 2017). It is ideal to explore connections and trends between variables in large-scale social investigations through a systemic process of sampling, data collection and analysis so findings can be generalised to the relevant research population (Bryman, 2016).

There is currently very limited information about pharmacists' current practice in different pharmacy practice settings in Saudi Arabia and there is no national competency framework or other standards for practice for pharmacists in any sector or stage of practice. The lack of this fundamental information and standards presented a barrier to identifying the competencies required for the effective performance of pharmacists and quality pharmacy education. Therefore, in phase 2a of this study, quantitative research methods were ideal to assess the relevance of the FIP GbCF (International Pharmaceutical Federation, 2012c) to the Saudi pharmacy practice environment and measure variation in the characteristics and central pattern of the pharmacists' practice and those competencies in different practice settings. These methods helped me to identify core competencies required for effective professional performance in the local context, which consequently was used as a basis to develop a national competency framework for pharmacists in

Saudi Arabia. During this phase of the study, quantitative methods were well suited to provide objective data that describes the overall trends, patterns and variations in the practice of pharmacists in different areas of practice related to the competencies of the FIP GbCF. This approach provided valuable information about the overall picture of pharmacy practice in Saudi Arabia.

In phase 2a of this research, a descriptive study design was used to measure the phenomena of interest. This involved a cross-sectional survey to measure the pharmacists' perception of the relevance of the FIP GbCF to their current practice at one-time point on one occasion only. This was easy to implement, inexpensive and yields results in a short period of time as data are collected at one time only. The inherent limitation of this design is that the generalisation of findings is specific to the time of data collection (Smith, 2010). Another inherent design limitation is the low response as the characteristics and opinions of non-responders might be different from those who responded. Although response rates for online surveys have decreased over years (Sheehan, 2001), Yun and Trumbo (2000) reported 20-30% as the typical response rate for online surveys.

The cross-sectional survey design of phase 2a, however, helped to describe the sociodemographic characteristics of the studied pharmacist population, assessed associations between the pharmacists' responses and these characteristics and described the dispersion of data and central tendency providing an overall picture of the respondents and their perceptions. In this study, I used a survey questionnaire as a data collection instrument. Therefore, in the following section, the focus will be on survey questionnaires, the method used to assess pharmacists' perception of the relevance of the FIP GbCF to their practice in phase 2a of this research.

3.4.2.1 Surveys

In social survey research design, data is collected using a structured instrument that is selected and devised to align with the study objectives (Smith, 2010). Structured interviews and self-administered questionnaires are the most employed methods in

survey research. In structured interviews, a questionnaire is administered by an interviewer for use in a structured interview whereas, in a self-administered questionnaire, respondents receive a questionnaire by post, email or via the web and complete it by themselves (Bryman, 2016). The choice of questionnaire type is dependent on the purpose of the study, the type of questions to be asked and research resources (Gray, 2021).

In phase 2a of my study, I used an online self-administered questionnaire to address the question: What are the competencies considered essential for pharmacists to address the required healthcare needs and pharmaceutical services in Saudi Arabia? This was cost-effective and reliable to collect relevant data about the relevance of the FIP GbCF to the current pharmacy practice from the sampled pharmacists. It provided a snapshot of the pharmacists' perceptions about the current environment of pharmacy practice in Saudi Arabia between August and November 2020. Self-administered questionnaires was selected over structured interview questionnaires because it is more convenient and practical for the pharmacist population to complete the questionnaire at the time and speed convenient to them and more likely to yield greater response in time available. As the study population was all registered pharmacists in Saudi Arabia, the use of an online type of self-administered surveys helped to access a large sample of the pharmacist population from different geographical areas at once with minimum cost. Details of the survey and its development is discussed in Chapter 5.

3.4.2.2 Sampling

Quantitative sampling strategies are broadly divided into two: probability sampling (where each unit in the population has the same chance to be selected) and non-probability sampling (where some units of in the population are more likely to be selected than others) (Bryman, 2016). The researcher must decide the appropriate approach for sampling that minimises sampling bias as possible (Bryman, 2016).

In Saudi Arabia, foundation level pharmacy practice has not yet been defined.

Therefore, all registered pharmacists were eligible for inclusion in phase 2a. As the

aim of this phase of the study was to assess the relevance of the FIP GbCF to the practice of pharmacists' in different practice settings, a purposive and snowballing sampling approaches were used to access the study population via the SCFHS, the licensing and registration body for all healthcare providers in Saudi Arabia; and the SPS, the professional society that represents more than 4000 pharmacists in Saudi Arabia. This helped to access the target population at once. More details about sample size and response rate as well as data analysis of the survey are described in Chapter 5 (section 5.5.3 and 5.5.4).

3.4.3 Mixed-methods research methods

Mixed methods research methods combine both quantitative and qualitative data collection and analysis in one study. The following section provides more details about consensus development methods as the mixed-methods research method adopted in phase 2b of this study.

3.4.3.1 Consensus development methods

Consensus development methods are considered among mixed methods because they organise qualitative judgements and opinions using ranking, questionnaires and statistical methods of analysis (Black, 2006).

Consensus methods are a common approach to developing consensus in healthcare policies and guidelines. They provide a means of synthesising a wide range of information systematically from appropriate experts in a group to make decisions, determine priorities, generate ideas or solve problems about a particular topic where scientific evidence or information is lacking or inadequate (Jones and Hunter, 1995; McMillan et al., 2016). In this approach, the unstructured traditional qualitative discussion becomes structured using quantitative documentation of opinions transparently and explicitly (Black, 2006). Consensus methods have the advantage of bringing a wide range of experience and knowledge from a group of stakeholders and experts in a specific topic or area of interest with an equal voice to minimise power imbalance between individuals in the group. They also provide

individuals anonymity where private ranking on a specific topic is taking place in which other members are unaware of others' judgement (Jones and Hunter, 1995).

These methods consist of multiple rounds to quantify the extent of experts' agreement (consensus measurement) and to identify and solve disagreement (consensus development) (Jones and Hunter, 1995). Repeated cycles lead to a gradual narrowing of the distribution of the responses eventually resulting in a consensus. There two best-known consensus methods are the Delphi Process and the nominal group technique (NGT). Both methods involve consensus measurement but NGT also involves consensus development (Jones and Hunter, 1995). Moreover, NGT provides the researcher with prompt results as the findings can be obtained quickly at one time compared to the Delphi technique which involves multiple rounds of questionnaires that are several weeks apart (McMillan et al., 2016). In phase 2b of this study, NGT was used to address the research question: What are the competencies considered essential for pharmacists to address the required healthcare needs and pharmaceutical services in Saudi Arabia? It offered a systematic approach to measuring and developing consensus among the group through multiple rounds of questionnaires and virtual meetings. NGT was chosen over the Delphi technique due to its demonstrated validity, adaptability, time efficiency and cost-effectiveness as well as the desire to involve direct interaction and discussion among experts to enhance consensus, rather than relying on purely statistical feedback as in the Delphi technique. More details about this method are provided in the following section.

3.4.3.1.1 Nominal Group Technique (NGT)

The NGT, also known as an expert panel (Jones and Hunter, 1995), is so-called because the group's viewpoint is generated through the aggregate of individual members' perspectives rather than the group arriving at a collective viewpoint (Black, 2006). NGT typically consists of multiple rounds in which experts rate, discuss, and re-rate a serious of items or questions. The quantitative part of the NGT uses predetermined statistical methods of data aggregation and analysis while the qualitative part entails an extremely structured face-to-face meeting to collect

information from a small group of experts about a particular issue in the presence of a facilitator (Jones and Hunter, 1995). A key strength of this approach is allowing individuals to see their response in comparison to the group's response, as it occurs in rounds, providing them with the opportunity to change their judgement in light of the initial views of all group members and hearing other different opinions (Jones and Hunter, 1995). The associated practicalities to organise a time that suits all panellists and geographical difficulties to attend NGT face-to-face meetings are the main limitation of this method. NGT is typically facilitated by either an expert in the topic or by a credible non-expert, with a non-participant observer to collect qualitative data on the nominal group. Although this approach has some common features with focus groups, the NGT focuses on consensus as a single goal and is less concerned with eliciting a range of ideas from the group as in focus groups (Jones and Hunter, 1995).

Traditionally, NGT comprises four key stages: silent generation, round robin, clarification and rating. In phase 2b, a variation from the traditional NGT was applied to the silent-generation stage. In addition to generating ideas about the competencies and behavioural statements required for foundation-level pharmacists in Saudi Arabia, a comprehensive set of competencies and behavioural statements were adopted from the FIP GbCF version 2 (v2) and phase 2a for the experts to rank. This approach is known as a modified NGT (McMillan et al., 2016). It enabled me to obtain greater consultation on the relevance and the appropriateness of the suggested list of competencies and behavioural statements to the Saudi pharmacy practice from the pharmacists (in phase 2a) as well as pharmacy experts (in phase 2b). It comprised three key stages as follows (Jones and Hunter, 1995; McMillan et al., 2016):

 Rating (Round 1): each expert received an online self-administered survey to rank privately whether each behavioural statement was appropriate to the Saudi pharmacy context using a 9-point Likert scale. The results were then summarised, tabulated and fed back to the experts to be used in Rounds 2 and 4.

- Clarification (Rounds 2 and 4): behavioural statements that showed a low level of agreement from Rounds 1 and 3 were presented for discussion and clarification in the panel meeting to ensure experts' understanding and enable them to make informed decisions in the re-rating stage (Rounds 3 and 5).
- Re-rating (Rounds 3 and 5): each expert received an online self-administered survey of a revised draft of the competency framework to re-rank privately in light of the Round 2 and 4 discussions on whether each behavioural statement is appropriate to the Saudi pharmacy context using a 9-point Likert scale.

3.5 Researcher subjectivity

In social science research, researcher subjectivity conceptualises the way that perspectives, values, beliefs, viewpoint and social experiences of the researcher influences the entire research (Davis, 2017). Researcher subjectivity equates to personal biases as they influence, directly or indirectly, the way how researcher collects, handles, interprets and reports data, which might invalidate findings (Davis, 2017). This is of particular importance in qualitative research in specific because the researcher is the human research instrument (Malterud, 2001). Understanding this made me aware that at every stage of this research my perspectives, background and position constitute the inquiry process because, in the context of knowledge construction, there is always a human contribution to any form of knowledge (Scotland, 2012).

Reflexivity is the process of attending systematically and analytically the role of the researcher in knowledge construction in qualitative inquiry (Dowling, 2006). Being reflexive means I must be critical to my background, life experiences and more broadly the wider social construct and consider how these might shape every aspect of the research process. In qualitative research, researchers are required to have a level of subjectivity as they often interact directly with research participants in the research field (Davis, 2017). The nature of methods in qualitative research

involves a large amount of data that I need to sort, organise and interpret based on my cognitive frameworks to identify and articulate meanings as well as patterns of social behaviour. Therefore, qualitative research relies upon my "researcher subjectivity" to reflect the meanings participants attached to their words and actions in a comprehensible manner to the general academic in the interpretation and data reporting (Davis, 2017). In pragmatic mixed methods research, however, some methodologists suggest keeping researcher subjectivity to an absolute minimum by strictly adhering to the analysed text similar to a quantitative perspective, while others insist that using the researcher's subjectivity and inner experiences leads to a better understanding of the research problem (Drapeau, 2002). I personally agree with the latter perspective and believe that subjectivity is reality and does not need to be eliminated because in the social world objectivity is also subjective (Giorgi, 1994; Davis, 2017). As knowledge is dependent on the knower within the subjective reality (LeVasseur, 2003), self-reflection and acknowledging researcher subjectivity are required to avoid the potential bias that may occur between the research and the researched. In this section, therefore, I describe my identity (professional background, personal standpoint and beliefs) and my position within this research as part of the self-reflection and subjectivity acknowledgement process.

I am a Saudi woman who has lived in Saudi Arabia since birth. I obtained my Bachelor's degree in Pharmaceutical Sciences in 2009 and a Master's degree in Clinical Pharmacy from King Saud University in 2013. Since graduation, I practised as a registered pharmacist in a non-MOH secondary care governmental hospital for almost eight years. In 2015, I was appointed as Director of the Pharmacy Department and was responsible for recruiting and training new pharmacists and assessing their performance at the end of the training period and the end of the year. During the two years of the management position, I became increasingly self-analytical and reflective of the performance of the recruited new pharmacy graduates. I noted and questioned the variation in their skills, knowledge, performance, motivation and enthusiasm towards their profession, especially since they were from different pharmacy schools across the country. Consequently, I

developed my interest in graduates' competencies and questioned the reasons why some graduates from certain pharmacy schools are more competent than those from other schools.

In 2017, I joined Prince Sattam Bin Abdulaziz University School of Pharmacy to work as a full-time academic. Being a new academic with a practice and management background in hospital pharmacy made me question the education methods utilised to prepare graduates with a consistent level of competencies and performance. This is reflected in my desire through this research to better improve the role of pharmacy education in developing effective competencies in pharmacy graduates. With further exploration of this area with the help of my supervisors to advance my research interest, exploring the competencies required for pharmacy graduates to practise efficiently in the Saudi pharmacy practice environment became a growing area of interest and manifested in the research questions in this thesis.

There is limited published literature about the graduates' competencies, quality of educational programmes and pharmacists' professional development opportunities in Saudi Arabia. Therefore, by studying this area, I hoped to identify core competencies required to address societal healthcare needs to inform the development of competency-based education required for graduates to maximise their capacity to the desired level of competence to meet the country's healthcare needs.

In the first year of joining the PhD programme, I completed the required courses to develop an understanding of research methods, which exposed me to the research paradigm of this research, i.e., pragmatism and mixed methods research approach. I found this paradigm suitable when considering how deep real-life contextual data is required to develop a comprehensive understanding of the current situation and quality of pharmacy education in Saudi Arabia. Therefore, exploring societal needs from pharmaceutical services using both quantitative and qualitative methods was suitable to reveal perspectives and factors required to develop pharmacy education outcomes which could not be explored if one method was used alone to develop

recommendations to inform local pharmacy education. Studying research methods opened my eyes to the fact that my pre-understandings and preconceptions are important dimensions that need to be considered and reflected on as they might affect my interpretive abilities. Being a graduate of one of the Saudi Pharmacy Schools made me conscious and aware of the ideas that I might have about local pharmacy education and how these might affect my understanding of the research question and findings. As my professional experience largely influenced my research interest in this topic, my thoughts were examined closely and documented continually in reflexive journals throughout the research journey to capture whether my pre-understandings resulting from my professional experience and educational background made me look only to the system's gaps and flaws. However, this was mitigated by examining my thoughts against participants' opinions and perspectives as well as triangulating these findings with other study findings within and outside of this research.

Being familiar with the research context and sharing a similar cultural identity facilitated conducting this research in the studied context. Sharing the same culture with the participants facilitated my understanding of their experiences and views towards the healthcare system and pharmacy services, and helped develop a rapport with the participants so that they were more comfortable expressing themselves during the interviews and focus groups. Sharing the same language helped me to understand the Saudi-Arabic dialect of the participants and avoid the need for an interpreter, which is an issue in cross-cultural research.

The Ministry of Education in Saudi Arabia funds my PhD, however, this did not influence the choice of this research topic or influenced reporting of the research data or findings in any way. In some stages of this research, I asked the Saudi Commission of Pharmacy Profession (SCPP) for help to access some policymakers for an interview but there was no financial benefit from this assistance. As a result, I find myself in this research committed to the discourse of pharmacy education development and have no hidden agenda.

Being a Saudi with a practice and an academic background allowed me to be neutral regarding the community and health system. Having eight years of practice-based professional experience in hospital pharmacy and one year's experience in academia, I did not feel like a true outsider or complete insider within the health system, with healthcare providers or academia because of my knowledge and background. This helped me to be in a neutral position towards topics discussed in the interviews and focus groups and to better observe with "open eyes" for a better understanding of the complete picture and find opportunities to improve pharmacy education without having a predetermined agenda. Being an academic with practice-based experience helped me to move around the insider-outsider position when collecting, analysing and interpreting the research findings.

During the data collection process, I introduced myself as a researcher from the University of Nottingham without revealing my professional background to minimise researcher influence and power. To put participants in an equal power position to me, I clarified that I did not represent any pharmacy organisation and was not in a judgemental position. I described that the study aimed to better understand their perspectives about pharmacy services and that the findings from these interviews will be used to develop recommendations to the related bodies not to report their practice or attitudes, which I believe, allowed the participants to express their true and complete opinions freely without any hesitation.

While researcher bias cannot be eliminated (Dwyer and Buckle, 2009), it was minimised by different measures in this study. To keep my thoughts and assumptions on track during the research process, I used a reflective journal to note my thoughts, assumptions and emotions after each interview and throughout the research process. Research supervisors were involved in every step in the research process to comment, provide feedback and enlighten any blind spots that occurred throughout. Self-reflection does not end here, rather, it was a continuous process throughout the study as evident in the steps undertaken to ensure the research rigour, as described in the following section.

3.6 Research rigour

The use of mixed methods research has become increasingly recognised in pharmacy practice research, therefore, rigorous research methods are important to assure the quality of findings and analysis and appropriateness of recommendations for policymakers, patients and other healthcare professionals. If applied correctly, mixed methods can generate high-quality research evidence due to the distinct advantage of maximising the validity and reliability of the research process (Hadi et al., 2013b). However, different criteria are used to assess the rigour and validity of qualitative and quantitative components of the mixed methods design. For the qualitative component, rigour is achieved by assuring trustworthiness, while in the quantitative component; this is achieved by assessing study validity, reliability and objectivity. In the following section, I will describe the strategies used to maximise the research rigour in both the qualitative and quantitative components.

Trustworthiness is used to describe the rigour of qualitative research (Lincoln and Guba, 1985; Guba and Lincoln, 1994). It comprises four sub-criteria: credibility, transferability, dependability and confirmability (Bryman, 2016).

Credibility refers to the believability and trustworthiness of the interpretations and conclusions within the underlying setting or group (Bryman, 2016; Onwuegbuzie and Leech, 2007). A possible threat to the credibility of this research was researcher bias, which was minimised by regular peer debriefing with the research supervisors and engaging in writing self-reflection notes before and throughout the interviewing process. Credibility was also ensured by prolonged engagement in the field during the interviewing process, analysing negative cases and triangulating data from both quantitative and qualitative sources within this research and data from other literature.

Transferability refers to the degree to which the study findings can be generalised across populations, contexts and settings (Onwuegbuzie and Leech, 2007).

Transferability is therefore concerned with providing a thick description of the contextual uniqueness and rich accounts of the details of the culture being studied,

which has been enhanced in this study by providing in-depth rich details to position the reader to transfer the findings to their context (Hadi and José Closs, 2016; Amin et al., 2020). A possible threat to the transferability of this research is reactivity, where participants change their responses when they are aware that they are part of the research investigation (Benge et al., 2012). This also includes their reaction when reporting to meet the researcher's expectations. Although it cannot be totally avoided, it was minimised by making the participants aware that they are part of a research process and explaining that there are no right or wrong answers, rather, their true opinion about their needs from the healthcare system and pharmacy services would enrich the research findings and recommendations.

Dependability refers to the consistency and repeatability of the study findings. A possible threat to dependability in this research was order bias which occurs when the order of the questions in the interview guide changes excessively over time making the findings incomparable (Benge et al., 2012). To ensure the dependability of the study findings, a fellow PhD researcher (SA), who was not involved in the research process, reviewed the data to see if they arrived to the same conclusions. This helped to assess data adequacy and preliminary results and verify that the findings are consistent with the raw data collected (Benge et al., 2012). Multiple coding during analysis of the interviews and focus groups were used also to enhance inter-coder reliability.

Confirmability refers to the confidence that the research findings are based on the participants' narratives rather than the researcher's potential biases (Bryman, 2016). This was ensured by using self-reflective journals, and audit trails to describe methods of data collection, data analysis and interpretation of data in detail, as well as triangulating the study findings with other data sources and supervisor (SB) coding of some data.

In quantitative studies, there are three criteria to describe rigour: reliability, objectivity and validity. Reliability is defined as the extent to which research findings are stable and consistently; objectivity is defined as the extent to which the

research instrument is free from researcher bias; and validity refers to the extent to which a concept is measured accurately in a quantitative study (Heale and Twycross, 2015). The following section will discuss how these three criteria were ensured in phases 2a (the national survey) and 2b (the survey of experts in the consensus measurement rounds of the expert panel).

To ensure validity, a research instrument should be designed to measure accurately what it was intended to measure. Selection bias was avoided in phase 2a by sending the survey to all registered pharmacists in Saudi Arabia, as this helped to ensure homogeneity as the pharmacists in every area of practice and province had the opportunity to participate in the survey. In phase 2b, the selection of experts was guided by and validated with other local experts to ensure that the recruited participants were of recognised expertise in their pharmacy sector. As the phase 2a study was cross-sectional, the data were collected at once which helped to avoid maturation as a threat in this study, in which any biological or psychological change within an individual that systematically varies over time can influence the study findings. Instrumentation bias was not a threat in phase 2 studies as the internal consistency of the instrument was tested and reported previously (Bruno, 2011). To avoid observational bias, I checked systematically the data for errors by crosschecking 10% of data with the original downloaded Excel spreadsheet from phase 2a as the data were cleaned and coded manually while in phase 2b, I cross-checked all the data at every round of consensus measurement.

Analytical validity refers to the validity of the data analysis process, hence the statistical conclusion of the study (Cor, 2016). As the quantitative studies/parts (phases 2a and 2b) were descriptive, descriptive statistics including distribution, central tendency, and dispersion were used to describe the differences in perceptions across practising pharmacists (in phase 2a) and expert pharmacists (in phase 2b) within different areas of practice and provinces. The responses in both surveys used Likert scale ranking to score responses, which might cause measurement assumption threat by the respondents where "strongly agree" might be weaker than "agree" response, for example. Cases of non-responses were not

avoidable in these studies, yet this was comparable to similar studies conducted elsewhere.

Construct validity refers to the extent to which variables reflect what the researcher wants them to reflect (Cook et al., 2002). The constructs I measured in study 2a were the relevance of the FIP GbCF v1 to the Saudi pharmacy practice environment in relation to the area of practice, educational background and other sociodemographic characteristics, while the appropriateness of the suggested list of competencies to the areas and levels of pharmacy practice was measured in phase 2b. In both studies, the selected study design allowed participants to participate once to avoid potential threats to the construct validity. The triangulation brought by the mixed methods design also diminished the bias that might result from using one method only. Nevertheless, the presence of confounding variables that may affect respondents' objectivity cannot be guaranteed in survey research.

External validity is concerned with the question of whether the study results can be generalised beyond the specific research cases, times and contexts (Bryman, 2016). In phase 2a of this research, the generalisation of the findings relied on similar cases where "competencies perceived relevant here should be relevant there". To ensure this, research must be representative of Saudi Arabia only, therefore, the study sampling was purposive and targeted all practising pharmacists in Saudi Arabia. However, low participation in the study mandated using snowballing sampling to maximise the response rate, which might have limited the generalisability of the findings. Another limitation of the study generalisation was the use of a self-administered survey, which risked that the survey was answered and completed by enthusiastic pharmacists only.

Across all stages and phases of this study, elements to ensure rigorous research were followed starting from selecting the study design to reporting the findings from both the qualitative and quantitative components. The approaches of sampling, data collection instruments, data sources, number of participants, data cleaning and coding, and analysis procedures were described in each Chapter in

detail to avoid ambiguity. Furthermore, any weaknesses in the rigour of the findings and how they were mitigated were also acknowledged and highlighted in the limitations sections of each study.

3.7 Translation considerations

In phase 1 of my study, data collection from the public focus group discussions and four professional individual interviews were in Arabic, therefore, it was necessary to translate Arabic transcripts into English before embarking on the analysis. As the translation is an interpretive act, assuring the accuracy of the translation from Arabic to English was of paramount importance to assure the appropriate representation of findings from respondents' subjective experiences without losing the meanings of the concepts during the translation process (Al-Amer et al., 2015).

In cross-language qualitative research, maintaining conceptual equivalence, i.e. providing an accurate technical translation of the participant's concepts, is the most important methodological challenge of such a study and is required to ensure the integrity, rigour and interpretation of the translated findings (Squires, 2009; Al-Amer et al., 2015). Despite its importance, maintaining a conceptual equivalence during the translation process may not be feasible, especially in languages such as Arabic, which is rich with cultural specific terms and concepts that might not have English equivalents (Kashgary, 2011). In this case, it has been suggested that fixed word-to-word translation should not be utilised if analyses may benefit more from using an equivalent to convey meaning (Bradby, 2002).

Another challenge of data translation is deciding when is the appropriate time to translate the data from qualitative research, i.e. before starting data analysis or when writing the findings after generating themes and concepts (Van Nes et al., 2010). Van Nes et al (2010) suggested using the original language and delaying the translation as much as possible. This argument is supported by the evidence from studies in the psychology and philosophy of languages, suggesting that language is considered an aid in thinking, and usual reading and talking in English might lead to thinking in English as well. Therefore, delaying translation will help to avoid the influence of analysing in a language that is not the researcher's first language.

However, Regmi et al (2010) recommend that translation before data analysis will enhance the rigour of the research process and minimise mistranslations caused by translating themes and concepts only.

I was the only member of the research team who shared the same language and culture as the study participants. This is in addition to the fact I am a novice researcher with limited experience in conducting the initial coding of qualitative analysis. Therefore, it was seen necessary to translate the data from Arabic (source language) to English (target language) to ensure the involvement of the supervisory team in data coding, analysis and interpretation in the early stages of the research process. More details about the translation process in phase 1 of this research are provided in Chapter 4.

3.8 Ethical and Safety considerations

This research sought and obtained ethical approval from the University of Nottingham School of Pharmacy Research Ethics Committee at three points during the study, namely for phase 1, 2a and 2b of the research (Ref. 011-2019). Approval forms are presented in Appendix 1. Since the data was freely available in public domains, ethical approval was not sought for phase 3 of this research, only permission was sought and obtained from one school, i.e. School B, to access specific relevant information from their curriculum (more details are provided in Chapter 6). In all research phases, participants' information sheets had a contact number in the case of any misconduct. In phase 1 public focus groups, permission was granted from the selected community centres before approaching their visitors. Informed consent was provided by all participants before starting the interview and recording processes. Confidentiality was maintained throughout the research process and data were stored securely in a password-protected Microsoft OneDrive account provided by the University of Nottingham. In accordance with the University of Nottingham Code of Research Conduct and Ethics, a lone working policy and assessment form were set out and completed with the School of Pharmacy Health and Safety Officer as phase 1 of this research was conducted overseas and without direct supervision.

3.9 Data collection timeline

The data were collected in four stages shown in Figure 3.1. The first stage took place between September and November 2019; the second stage was between August and November 2020; the third stage was between July and November 2021; and the last stage was between November 2021 and April 2022.

3.9.1 Impact of COVID-19 on the research process

The Coronavirus disease 2019 (COVID-19) pandemic introduced many challenges to this research similar to many researchers worldwide. Fortunately, phase 1 data collection was complete before the COVID-19 outbreak. However, the data collection stage of phase 2a was impacted. I contacted the SCFHS in February/March 2020 to ask for assistance in distributing the online survey to all registered pharmacists in Saudi Arabia. During this process, the first COVID-19 case was reported in Saudi Arabia. The Saudi Authorities adopted national lockdown measures to contain the COVID-19 outbreak in March 2020. This significantly delayed the progress of distributing the survey by six months from early March 2020 to late August 2020. This delay affected the progress of the following research stages, hence, the overall research progress. The supervisors and I decided that delaying the phases of the research was the best solution to mitigate the challenges imposed by the COVID-19 pandemic on the research progress.

So instead of collecting data as planned from early March 2020 to June 2020, phase 2a was conducted from late August 2020 to November 2020. In phase 2b, the supervisors and I decided to replace the face-to-face meetings of the consensus development rounds from the expert panel with online meetings using Microsoft Teams Videoconferencing platform to align with social restriction measures imposed by the Saudi government at that time. To achieve a greater number of consultations about the competencies of the FIP GbCF with practising pharmacists, this phase started after the completion of phase 2a, so, instead of collecting data as planned from May 2020 to December 2020, data collection was conducted from

July 2021 to November 2021. Phase 3 did not require any mitigating measure as the data was publicly available online but, as part of the overall research, this phase was also delayed so the final version of the proposed national competency framework could be used as a template for the curriculum mapping process. Therefore, the data collection of phase 3 was conducted from November 2021 to April 2022 instead of January 2021 to June 2021 as per the planned pre-COVID-19 timeline.

During the six months delay of launching the phase 2a survey, I focused on analysing and writing up the findings of the phase 1 study. This was challenging due to the demands of home schooling and family care imposed by the local lockdown measures of the UK government. The increased stress of balancing home and work-related demands simultaneously was an additional challenge to maintaining the research timeline and progress as planned at the beginning of this research project.

3.10 Chapter summary

This chapter has provided a detailed description of the methodological approaches used in this research. A pragmatic and exploratory sequential mixed methods research design were used to answer the research questions described in Chapter 2. I described the justification for the use of exploratory sequential mixed methods design and how each of the qualitative, quantitative and mixed methods components of the selected design helped to develop a comprehensive understanding of the status of pharmacy education in Saudi Arabia. The subsequent chapters describe in detail how each phase of the study was carried out, using the appropriate methods for data collection and analysis, in order to address the research questions and aim of the study.

Chapter 4: Healthcare needs assessment- identifying unmet needs of the population

4.1 Introduction

This chapter describes phase 1 of this research- a healthcare needs assessment study to explore local healthcare needs of the population and identify the roles required by pharmacists to address those needs. The chapter also presents the methods, data collection and data analysis as well as the findings and implications for practice for this phase of the study.

4.2 Aim

To explore societal healthcare needs that can benefit from pharmacists' care and identify the required roles of pharmacists to meet these needs in the Saudi context.

4.3 Objectives

- 4.3.1 To explore the perceptions of pharmacy stakeholders regarding the societal healthcare needs that can benefit from pharmacists' care in Saudi Arabia on a national level.
- 4.3.2 To identify the required roles of pharmacists and pharmaceutical services to meet those needs.

4.4 Methods

4.4.1 Study design and tools

A qualitative healthcare needs assessment approach was adopted in this phase to explore the perceptions of the public, policy makers and pharmacists about societal healthcare needs that can benefit from pharmacists' care services. This qualitative phase comprised semi-structured individual interviews and focus groups. Individual interviews were conducted with the professional participants, namely, policymakers and pharmacists, and the perspectives of the general public participants were collected via focus groups. As described previously in Chapter 3 (section 3.4.1.1.1 and section 3.4.1.1.2), the choice of individual interviews for the professional group

and focus groups for the general public group was informed by methodological, logistical and practical reasons.

For each group, a semi-structured interview guide was developed based on the literature review and study objectives (Appendix 2 and Appendix 3). The purpose of these guides was to stimulate conversation, guide discussion and ensure that the required information was obtained. Both interview guides were reviewed and checked by the research supervisors and local expert (IA) to ensure face and content validity 1. To ensure clarity and appropriate understanding of the questions, the interview guide of the professional group was pilot tested with a convenient sample from my professional and personal network, which were three Saudi pharmacists, while the interview guide of the general public was pilot tested with three relatives before starting the fieldwork. Both guides started with a brief introduction about the research topic, then questions about educational and career background, followed by the main questions, probes and prompts and then exit questions to ensure that there was no aspect missed. The main questions were exploratory open-ended questions about their perceptions regarding the most prevalent healthcare needs, and current and potential roles and services of pharmacists in the country. Although the questions were similar for both groups, the focus group interview guide was designed to prompt general discussion and interaction within the group and stimulate participants to respond and discuss with each other rather than only answering my questions. Therefore, the questions were designed to be succinct, precise, and clear and have been worded effectively to avoid damaging the rapport within the group, hence, the overall data collection process (Braun and Clarke, 2013). The questions in both guides were refined and reviewed continuously throughout the interviewing process, with no major changes to the questions. In the interview guide of the professional group, one question was added during the fieldwork regarding a topic raised by the participants about the missing pharmacists' roles and services in Saudi Arabia. The semi-structured design

¹ The local expert (IA) is a registered Saudi pharmacist with more than 18 years of experience in the pharmaceutical field. At the time of consultation, (IA) held a leadership position within the pharmaceutical care department of the Saudi MOH and the SCPP of the SCFHS.

of the interviews allowed the flexibility of adding additional and probing questions to follow up with the respondent's views, thereby increasing the depth and richness of the information and providing more structured data on issues that may carry considerable implications. Table 4.1 summarises key areas explored from the professional and general public interviews.

Table 4.1: Key areas explored in the individual interviews and focus groups

Individual interviews of the	Focus groups of the general public
professional group	group
The most prevalent healthcare	Theirs and others' healthcare needs
needs in Saudi Arabia	The main services that they or
 Current pharmacists' roles and 	others need from the pharmacist
services in the Saudi healthcare	Their expectations of pharmacists
system	Their experience of dealing with a
 The public's expectations of 	pharmacist
pharmacists	

4.4.2 Sampling, selection and participants

Key stakeholders for the study were selected based on the specific categories suggested by the FIP for pharmacy education quality assurance (International Pharmaceutical Federation, 2014) to ensure a broad spectrum and fair representation of major stakeholders within pharmacy education and practice. This included the general public, professional and scientific associations, individual educators, practitioners from different sectors of pharmacy practice, pharmacy school deans, the pharmaceutical industry, continuing education providers, accreditation agencies, governmental agencies and regulatory bodies. Recruitment of the professional group from the aforementioned stakeholders employed purposive and snowballing sampling strategies, whereas a convenient sampling strategy was adopted for the general public group. Further details are provided in the following sections.

4.4.2.1 The professional group

A purposive sampling strategy was utilised first to identify a small sample of specific local stakeholders in various sectors of pharmacy education and practice. This was

conducted before establishing the fieldwork in Saudi Arabia to help to develop effective communication strategies with the participants and facilitate the interviews within the time allocated for the fieldwork. However, purposive sampling is prone to selection bias as the researcher selects participants based on their judgment of appropriateness to answer the research question. To minimise this bias, the identification of key informants was conducted in consultation with the SCPP 2 to maximise the inclusion of relevant key informants from different areas of pharmacy practice in Saudi Arabia. As the study progressed, subsequent participants were identified and recruited through a snowballing approach, whereby recruited participants recommended or referred potential participants. This maximised the representation of the various pharmacy sectors, particularly from the hard-to-reach policymakers and practitioners. Each participant referred by an existing participant was contacted and asked for voluntary participation. Inclusion criteria for professional stakeholders were: Saudi healthcare professionals and/or policymakers, key informants as determined by the FIP pharmacy education quality assurance categories (International Pharmaceutical Federation, 2014), willing to participate and provide informed consent.

Most key informants were identified and accessed in cooperation with the SCPP and, with their approval, the SCPP provided their contact details to contact them directly. For other key informants whose contact details were not available with the SCPP, public source (i.e., professional social media, namely LinkedIn, or Google search) were utilised to obtain their mobile numbers or email addresses. For those who were suggested by exiting participants, contact details were provided by the participants with their consent.

Emails were sent to the potential participants explaining the study aim and purpose to ask for voluntary participation. One to two key informants from each of the FIP quality assurance categories were contacted to participate in the individual interviews. Once potential participants expressed their willingness to participate,

² SCPP is the body that represents the pharmacy profession within the SCFHS.

they were sent the study information sheet and consent form to sign before conducting the interview. Thereafter, all key informants were interviewed individually at their convenience in their workplaces.

25 interviews were conducted with key informants spanning all pharmacy stakeholders categories identified previously (Table 4.2). It is important to note that most participants held several positions at the same time, e.g., full-time academic and chair of a professional body. All interviews were conducted face to face.

Table 4.2: The distribution of professional participant by sector

Sector	Description	Number of
		participants
Academia	Pharmacy schools and universities	5
Hospital	Governmental (MOH, Military,	6
	Referral/Specialist, University) and	
	private	
Community	Chain/ independent pharmacies	3
Professional	SPS, SCFHS	2
bodies		
Governmental and	MOH, SFDA, NCAAA, Saudi Health	6
regulatory	Council	
authorities		
Manufacturing	Manufacturer and pharmaceutical	3
industry	companies	
Total		25

Professional interviews lasted from 25 minutes to 80 minutes, with a median of 50 minutes. All participants were pharmacists, except two, one was a Family Medicine physician and the other was a health strategist, both, however, were interviewed as policymakers within pharmacy governmental and regulatory authorities. Among the participants, four (16%) were female. The gender balance was difficult to attain within this group especially because 80% of pharmacists in Saudi Arabia are male (Ministry of Health, 2020). However, as the research is related to needs-based workforce development, gender imbalance was believed unlikely to skew the study findings. Table 4.3 describes the demographic characteristics of the professional group.

Table 4.3: Demographic characteristics of the professional participants (n=25)

Characteristics	Number of participants (%)	
Gender		
Male	20 (80)	
Female	4 (16)	
Age, years		
20-30	1 (4)	
31-40	10 (40)	
41-50	8 (32)	
51-60	6 (24)	
Highest degree of education		
Bachelor's degree	3 (12)	
PharmD	6 (24)	
Master's degree	4 (16)	
PhD	11 (44)	
Other	1 (4)	
Years in current area of practice		
≤5	4 (16)	
06 -10	5 (20)	
11-20	11 (44)	
21-30	5 (20)	

Of the 25 participants, four chose to conduct the interviews in Arabic and applied code-switching, which is the alternating use of two languages by a bilingual speaker in the same context (Bullock and Toribio, 2009). The use of code switching by the participants in this study was to emphasise a specific point or to clarify a particular pharmaceutical term where they felt it would be better done in English rather than Arabic for accuracy. Details about the data translation process of the professional group are provided in section 4.4.4.

4.4.2.2 The public group

The study topic is believed to be of relevance to everyone, including both healthy and unhealthy individuals within society. Therefore, the sample group was identified and recruited from public places through convenience sampling.

To allow for exploring a wide range of perceptions and experiences about unmet societal healthcare needs in the Saudi context overall, data from the general public were collected in five cities from five geographical zones in Saudi Arabia (Table 4.4). Makkah, Riyadh and Dammam were chosen because they are metropolitan and have a high socioeconomic status (AlOmar et al., 2018), with 26.2%, 25.2% and 15.1% of the Saudi population respectively living in these regions. Jazan and Tabuk are the main peripheral cities in the Northern and Southern regions with lower socioeconomic status (AlOmar et al., 2018) and lower population density, 4.8% and 2.1%, respectively. Therefore, the selection of cities was believed to be suitable to explore different perspectives of the general public about unmet societal needs.

Considering the study resources, as mentioned earlier, it was decided to recruit at least five focus groups composed of at least three to ten participants from the selected five cities. Inclusion criteria for the public participants were Saudi, more than 18 years of age, willing to participate and provide informed consent.

Convenient sampling was used to recruit participants from public places, i.e., community centres. Besides its convenience, accessing potential participants in their setting was considered appropriate to provide them with the power to express their opinions freely, thereby minimising the risk of researcher power or influence on the participants. Therefore, five community centres were identified from each city using Google search and then contacted by phone. I introduced myself as a doctoral researcher and explained the aim and purpose of this study, then asked permission to access the centre and recruit a group of participants, both male and female as genders are usually segregated in Saudi Arabia. The centres welcomed cooperation but asked for a formal letter from a local university to prove that the research was official. Therefore, I asked the Deanship of Scientific Research of Prince Sattam Bin Abdulaziz University (the university where I worked in Saudi Arabia) to provide a letter to facilitate the fieldwork in Saudi Arabia. This letter provided information regarding my local affiliation name and address, job title, contact details and a brief description of the research alongside a request to facilitate the data collection process in these centres. The letter was sent to the

centre's administration departments with the research invitation poster to distribute in the centre. Thereafter, the focus groups were conducted at the community centres at their convenience. The centre's administration also assisted participant recruitment by distributing the research poster and/or sending text messages explaining the aim and purpose of this study to centre visitors, asking for voluntary participation and organising a mutual time and place to conduct the focus groups.

Within the public group, a degree of homogeneity among participants but with sufficient variation to allow contrasting views to provide rich and comprehensive information about societal health needs was required. Therefore, eight focus groups of 53 participants in total were conducted in Makkah, Riyadh, Dammam, Tabuk and Jazan. All were Saudis with various educational levels (i.e., none, primary, intermediate, secondary and university level) and employment status (i.e., student, employee, retired, housewife and unemployed). They spanned a range of age groups from 18 years to older than 65 years. Overall, 34 (64.2%) were from the metropolitan cities, i.e., Riyadh, Makkah and Dammam. Most participants, 38 (71.7%), had a university education level and 22 (41.5%) were employed either in a governmental or a private sector. Due to social and cultural reasons, there were no mixed genders in the focus groups but there was a balanced gender representation in this study with 27 (51%) male participants and 26 (49%) female participants in separate groups. The focus group discussions lasted from 27 to 64 minutes with a median of 51 minutes. Table 4.4 describes the demographic characteristics of the public participants.

Table 4.4: Demographic characteristics of the public participants (n=53)

Characteristics	n (%)
Gender	
Male	27 (51)
Female	26 (49)
City of living	
Riyadh	17 (32)
Makkah	17 (32)
Dammam	12 (22.6)
Jazan	4 (7.5)
Tabuk	3 (5.7)
Age, years	
18-30	18 (34)
31-40	13 (24.5)
41-50	9 (17)
51-60	3 (5.7)
>61	10 (18.8)
Level of education	
None	3 (5.7)
Primary	3 (5.7)
Intermediate	4 (7.5)
Secondary	5 (9.4)
University	38 (71.7)
Currently under the treatment of any health condition	
Yes	19 (35.8)
No	34 (64.2)
Employment status	
Student	2 (3.7)
Employee in General or private sector	22 (41.5)
Retired	10 (18.9)
House wife	15 (28.3)
None	4 (7.5)

4.4.3 Data collection

The interviewing process for individual interviews and focus groups started simultaneously in late September 2019 and took over two months. No more than two individual interviews or one focus group were conducted per day to allow enough time to process and reflect on the data collected. Before starting the interviewing process, I introduced myself and briefly described the aim and expectations of participation in the study. Then, information sheets were distributed while answering any questions or clarifying any points regarding

participation. The participants were asked to sign a consent form and to fill in a form about their demographics (Appendix 4 and Appendix 5). To maximise the honesty and credibility of views, participants were reminded about the confidentiality obligation, that there are no right or wrong answers, that they have the right to withdraw from the research at any time and that they can stop the interview or ask questions at any time. For the focus groups, additional ground rules were provided to facilitate discussion including that only one person should speak at a time, they did not have to speak in a particular order, and they do not have to agree with the views of other people in the group. I encouraged participants to share any information or experiences related to the research discussion and the importance to hear everyone's opinions. During focus groups, as the facilitator, I guided the discussion by asking questions from the interview guide and, when necessary, handling participant dominance. The participants showed common communicative grounds and added contributions as they agreed or disagreed with the views. As the group dynamics relaxed, participants generated a wider range of views as they shared more personal experiences and opinions which was an advantage provided by the focus group design.

During the public focus group discussion, data collection was conducted in Arabic whereas, in the professional group, participants were given the choice to conduct the interviews in Arabic, their mother language, or English as most of them, if not all, are bilingual. As words are used to express meanings of subjective experience in qualitative interviews, language has a central role in all phases of qualitative research because it is the medium to deliver such words. Therefore, in this study, participants were allowed to choose the language they prefer or feel comfortable with in communicating and expressing their perceptions and ideas. Details about the data translation process of the Arabic interviews from the public and professional groups are provided in section 4.4.4.

Before ending the interviews, participants were asked if they wanted to share or add any additional information related to the research topic. Field notes were taken during interviews and 'self-reflection notes' were taken as soon as possible after

conducting the interviews. Researcher's reflection on their experience during data collection illustrates a key characteristic in qualitative research: reflexivity. It serves also as a supplementary information source to help the researcher to re-live impressions or feelings when analysing related interviews, which usually takes months after interviews. It also assists the researcher to reflect on the main findings and codes that might need to be explored further (Braun and Clarke, 2013). Therefore, a self-reflection note was utilised during data collection to reflect on the participants' interactions, self-representation and important features of responses during and after each interview. By that, I acknowledged my centrality to the research process as a way to maximise reflexivity and maintain transparency and methodological rigour (Jasper, 2005). All interviews were audio recorded and transcribed verbatim in their original language to ensure the meanings intended by the participants were maintained and imported to NVivo12 (Qualitative Analysis Software).

4.4.4 Translation process

The process of data translation started with the translation of professional and public interview guides from English to Arabic by a bilingual certified translator. This decision was made to assure that the translated guides are accurate and of high quality, as these guides will be used throughout the interviewing process.

Thereafter, I checked the accuracy of the translated interview guides by comparing the translated questions with the original questions to assure equivalence in meanings. Then, the translated interview guides, both professional and public, were pilot tested before conducting the study to test clarity of the interview questions with a convenient sample of three Saudi pharmacists and a focus group of three Saudi public participants from my professional and personal networks.

As mentioned, all interviews were transcribed verbatim in their original language, including the Arabic interviews. These included four interviews from the professional group and eight from the public focus groups. As the translation itself is an interpretation process, the meaning transfer chain from one language to another might be lost for one phase to another (Van Nes et al., 2010). Therefore, it

was decided to keep intact English and Arabic phrases during code switching as well as features of Saudi dialect. This decision aimed to maintain the accuracy in the representation of the views and perceptions, from participant to reader, as that may be affected in different phases of the translation (Regmi et al., 2010; Van Nes et al., 2010).

Thereafter, a dedicated translator, who signed a confidentiality agreement, worked the 12 Arabic transcripts and translated them from Arabic-1 (sources language) to English-1 (target language). The translator is a bilingual Saudi researcher, with a postgraduate degree in English linguistics and three years of translation experience in a research centre at a Saudi governmental university. As the translator has no health speciality background, it was agreed to develop a lexicon for repeated keywords or technical terms to ensure consistency throughout the translation process. Throughout the translation process, the translator and I checked this lexicon for any discrepancies. After submission of each translated transcript, a debriefing session between the translator and I was conducted to ensure the data accuracy and credibility of translation in each transcript (Van Nes et al., 2010; Al - Amer et al., 2015). Both the translator and I are Arabic-English bilingual, native speakers of Saudi dialect, therefore, miscommunication or ambiguities in the translation process were minimal.

Back translation, from the target language (English) to the source language (Arabic) is highly recommended and the most common way to evaluate conceptual equivalence (Brislin, 1970; Chapman and Carter, 1979; Chen and Boore, 2010). Therefore, I conducted the back translation of the full 12 translated transcripts from English (1) to Arabic (2). In order to check for misinterpretation or loss of equivalence between original transcript before and after translation, I compared the 12 back translated Arabic (2) transcripts with original Arabic (1) transcripts (Figure 4.1). After the review, I found no discrepancies between original and back translated transcripts as they reflect the original meanings accurately.

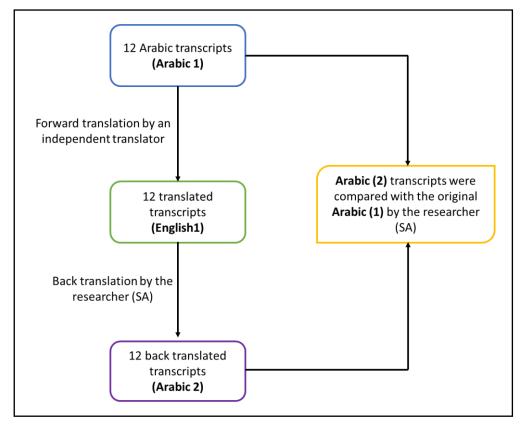


Figure 4.1: Flowchart of the translation process

4.4.5 Data analysis

As the aim of this study was to explore and describe societal healthcare needs within the Saudi context, thematic analysis was used to analyse the data.

The data analysis started once the data collection phase finished because the allocated time for the fieldwork was sufficient for the data collection phase only. The data analysis involved transferring audio-recorded files from the audio recorder device to a secure computer, anonymising the audio files, transcribing them verbatim into their original language, translating the Arabic transcripts and checking the quality of all transcripts contents to the original interviews. The transcripts then were imported into NVivo 12 for data management and coding. The thematic analysis was conducted according to Braun and Clark's (2006) six-phase framework: (1) familiarisation with data, (2) generation of initial codes, (3) searching for themes, (4) reviewing of themes, (5) definition of themes, (6) writing up the themes.

Before coding the transcripts, the first stage of analysis requires the researcher to familiarise themselves with the data by reading and rereading the transcripts because ideas and patterns might be shaped when researchers become familiar with all aspects of their data. In addition to reading and rereading the transcripts, I found transcribing and translating the data as well as checking translated transcripts with original transcripts helped to familiarise myself and engage actively with the data. During the transcribing process, I wrote down some reflective thoughts, notes and preliminary codes of words and phrases, which helped to sort out some analytical considerations that needed to be explored further in the focused coding process.

The second stage of analysis involved generating initial codes whereby data that capture specific characteristics related to the research question are identified systematically and given a label (Cassell and Symon, 2004). In this stage, line-by-line coding was adopted to allow the inductive emergence of codes from the raw data. The use of NVivo aided the initial coding process as it allows a comprehensive line-by-line coding of the entire dataset. I coded as many patterns as possible multiple times to retain the data context. To minimise the inherent subjectivity of this process, two transcripts from the individual interviews and two transcripts from the focus groups were coded independently by one of my supervisors (SB) and then compared with my codebook to enhance inter-coder agreement on the codes and refine the coding process.

The third stage of analysis is the interpretative analysis of codes whereby all related coded extracts were classified and grouped into categories searching for themes that summarise the essence of categorised codes.

In the fourth stage, the coded data extracts for each theme were reviewed to examine if they form a coherent pattern and whether they reflect the evident meanings from the data overall. To review the identified themes, I checked themes with coded extracts to ensure they were specific, discrete and broad enough to

capture ideas represented in each segment of data in a way that makes the themes significant and succinate to summarise the text.

After reviewing the themes, the fifth stage included providing the identified theme names and definitions that reflect the essence of the theme clearly and concisely. This stage also identified subthemes as they help to make each theme fit into the overall picture. Triangulating the different findings from stakeholders during data analysis was helpful to provide a comprehensive understanding of the resulting themes and uncover the complexities of the research topic.

The last stage included transferring the analysis into an interpretive writing report that provides a concise, non-repetitive, coherent and logical account of data across themes. Returning to the literature for comparisons with the emerging themes helped to scale up and refine analyses to develop a story out of the final themes.

The process of data analysis was discussed and reviewed with the research supervisors at different stages of the data analysis. Thematic maps were used to illustrate, discuss and revise potential themes with research supervisors at every supervisory meeting during the data analysis phase. To tackle complexities in data similarity and differences, negative or contradicting categories and findings explanations between them, One Sheet of Paper (OSOP) was used to summarise and study the data visually. OSOP is used to summarise one code or theme of data visually in one sheet of paper to help identify the correlation or explanations between concepts (Ziebland and McPherson, 2006). The NVivo codebook of the main categories and the tabulated summary of the findings were used to summarise the main elements in OSOP format, which was helpful to understand the similarities and differences between the professional and public groups and make them fit in the final picture of analysis. It was also helpful in mapping the findings by ensuring all data extracts were considered and structured into a written report.

4.5 Results

This section reports the findings from the professional interviews and public focus groups. As the background of the participants and methods used for data collection were different, the findings from each group are reported separately in sections 4.5.1 and 4.5.2 based on the identified overarching themes and themes. To provide a better understanding of societal healthcare needs in Saudi Arabia from multiple perspectives, the findings from both groups were then triangulated and discussed in section 4.6. The findings from each theme within each group are illustrated using quotations. Each participant within the professional group was given an identification number followed by their gender and practice setting (e.g., Interview 1, Male, Academia) while focus groups were given an identification number followed by the gender and the city from which they come (e.g., FG 1, Male, Riyadh).

4.5.1 Findings from the professional interviews

Two overarching themes were identified representing societal healthcare needs to professional participants: health system-related and pharmacy profession-related. Figure 4.2 illustrates the identified overarching themes with their associated themes and subthemes, which I will now discuss:

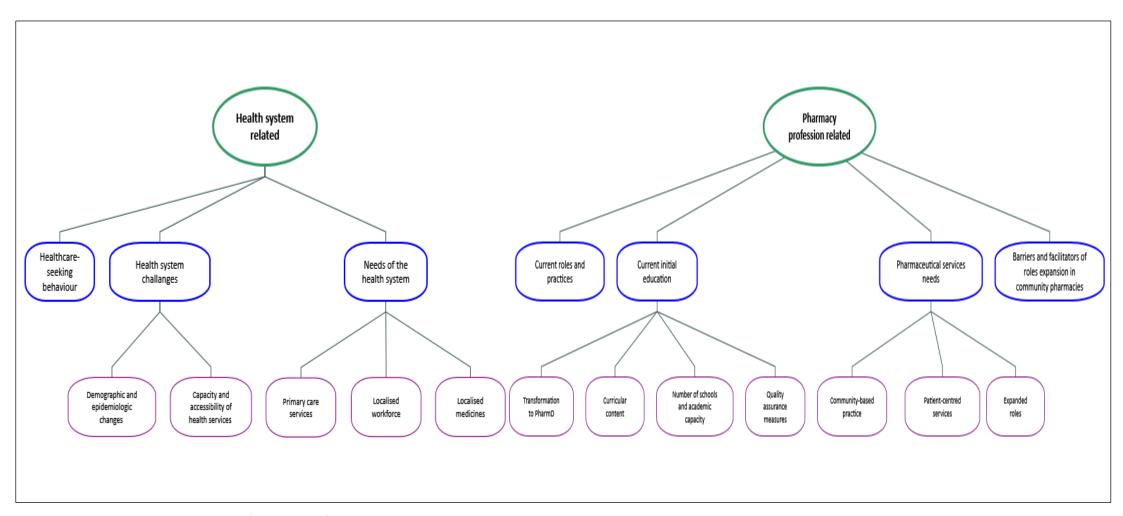


Figure 4.2: Findings from the professional group interviews

4.5.1.1 Health system related

This theme captures the participants' views of the health system services and to what extent they think they meet consumers' needs and expectations. It also describes several healthcare-seeking behaviours, challenges currently facing the health system and insights into the consumers' needs and expectations of health services.

4.5.1.1.1 Healthcare seeking behaviour

The interviews revealed a range of health beliefs and healthcare-seeking behaviours, including uncertainty about the right healthcare facility to visit to seek help. All participants cited this behaviour as a result of the ineffective role of the PHCCs as the first point of care in the Saudi healthcare system. For example, participants indicated that most patients go to hospitals or the Emergency Departments of hospitals for minor illnesses such as fever or flu. This tendency for people to go inappropriately to hospitals for such conditions was considered have resulted from the focus of the health system on developing tertiary and secondary care hospitals rather than PHCCs leading people to believe that hospitals are the right place to visit for all health conditions.

At certain times, in the 80s and 90s, the focus (of the health system) was on tertiary care hospitals, so, once the patient gets sick, they find top-notch hospitals to treat them (Interview 21, Male, Professional Body).

The type of illness, financial status and eligibility status of patients was also thought to direct their choice of healthcare facility. For example, if the illness is minor or acute and the patient is financially capable, they prefer going to a private polyclinic or private hospital and if the illness is chronic or minor but they are financially incapable, they go to a governmental hospital. Patients who are eligible for treatment in more than one governmental hospital were reported to move between hospitals seeking the right healthcare as they all are free.

Because we do not have a primary healthcare service, I choose an epic health service. If I am sick (with a simple health condition) and want to finish quickly, I go to (private hospital) and if (my condition) is chronic, I go to (governmental hospital). So, I am picking and choosing the service. Commons do the same, even if they have insurance from their employers or medical profile in multiple governmental hospitals, they still pick and choose from either governmental or private hospitals (Interview 3, Female, Academia).

4.5.1.1.2 Health system challenges

This theme captures the views of professional participants about challenges currently facing the health system, highlighting the growing and ageing population as well as changing patterns of diseases as the main challenges.

4.5.1.1.2.1 Demographic and epidemiologic changes

Most participants viewed the growing population as a challenge currently facing the Saudi health system, which was contributing to the increasing demand on the capacity of hospitals, healthcare professionals, medicines and services. Most participants also highlighted the lack of current capacity of the health system to respond effectively to the increasing elderly population's healthcare needs, especially chronic disease services and social care support. One participant commented:

It concerned me that we are [health system] not thinking about the future. Now, maybe the elderly population, 70 years and above, are not a large percentage (of the population) but they will be in the future. They will become the largest percentage... Are we continuing to need hospitals only? (Interview 3, Female, Academia).

Another reported challenge to the Saudi health system was the current mixed pattern of diseases in Saudi Arabia: communicable diseases, genetic diseases, and

NCDs. Of note, NCDs, including diabetes, hypertension and cancer, were considered by most participants as the main health issue due to unhealthy lifestyles, as well as the lack of health promotion and disease prevention programmes. Diabetes, in particular, was highlighted as a priority area that requires immediate action from the health system due to the high prevalence and the significant economic burden resulting from long-term management.

Diabetes is a huge problem in Saudi Arabia and is not well represented because most of the mortality and morbidity are related to other diseases such as cardiovascular diseases.

Policymakers do not see diabetes as [important] as [cancer], they think that [cancer patients] are in more need than the [diabetic patients]. So, sometimes we [health system] work on the urgent [goals] rather than the long-term goals (Interview 4, Female, Academia).

4.5.1.1.2.2 Capacity and accessibility of health services

Some participants believed that there is an ineffective distribution of health resources among hospitals in Saudi Arabia. For example, hospitals in main cities such as Riyadh and Jeddah were considered to have better-allocated resources including budget, hospitals, facilities, healthcare professionals and medicines compared to other cities, which might have affected the quality and efficiency of care service delivery between hospitals in main cities and others in the periphery with limited resources. A participant from a regulatory body felt that the lack of a unified healthcare model that governed the efficient distribution of resources to all hospitals contributed to the variation in the budget allocated to hospitals, hence, shortage or unavailability of some resources in some institutions.

Big hospitals with the (high) support will have good management of resources and will have a good stock (of medicines) while others might not have the same thing (Interview 16, Male, Regulatory Body).

Accessibility to health services in terms of equity and efficiency was reported as a huge gap in the health system. Some participants reported that access to quality health services and resources is better in main cities than in peripheral cities and that accessibility to secondary and tertiary hospitals is easier than accessibility to PHCCs. Consequently, patients use hospitals as the gateway to the health system which creates operational and financial burdens on the health system. Participants reported that patients are not receiving the right care from the right physician in a timely manner from the first visit. Most importantly, all participants agreed that the ineffective role of the PHCCs as the gateway to the health system is the main reason for the inequality and ineffective accessibility.

Now, we have free access to healthcare for sure. Everybody can go anywhere. But do they receive the best care? No. Myself, as a part of this hospital, sometimes I have difficulties seeing my primary care physician. Sometimes I jump to a specialized consultant because the primary doctor is not available (Interview 23, Male, Hospital).

The inefficiency of the PHCC's role and service was cited due to the focus of the health system on developing the curative care model through secondary and tertiary specialised hospitals rather than the preventive care model through PHCCs. Most participants considered the limited resources allocated to PHCCs, including equipment, medicines, and healthcare professionals, especially family medicine physicians, as well as limited available services, poor quality services and ineffective referral practices from PHCCs to the associated hospitals are the main reasons for the patients' dissatisfaction of PHCCs and the high level of hospital services utilisation. Using secondary and tertiary care resources for primary care services was believed as an inefficient use of existing capacity, placing additional financial and operational burdens on the health system and contributing to the long waiting lists and waiting time in hospitals.

The problem now with the Saudi healthcare system is that the first gate (to healthcare) is the tertiary and the secondary (hospitals).

This is because the PHCC is failing to respond to the public's needs.

The driving cost for health care expenditure (in the country) is

tertiary care because people use these facilities for primary and
secondary care services (Interview 18, Female, Regulatory Body).

4.5.1.1.3 Needs of the health system

This theme captures the views of professional participants regarding the approaches that could extend the capacity and responsiveness of the health system to fulfil the above-mentioned system challenges and changes as well consumers' needs and expectations.

4.5.1.1.3.1 Primary care services

Reflecting on the previous preventive model of care adopted in the 1970s, where primary care services were provided in PHCCs, participants strongly believed that current demographic and epidemiologic changes in the population as well as accessibility and capacity challenges of the current model of care require activation of the previously successful model. Participant stressed the need to activate primary care services again that involves treatment of common diseases, managing long-term conditions, health education and disease prevention, vaccination and screening programmes in PHCCs to improve health system responsiveness towards the current pattern of diseases.

Most participants believed that using PHCCs as the gateway to the health system would enhance effective accessibility to the relevant healthcare service or speciality thereby achieving the best possible outcomes at the right time and right place. Some participants thought this would also ensure health equity and fairness of access, as well as improve the healthcare-seeking behaviour of individuals by reducing unnecessary visits to multiple hospitals and reduce out of pocket payments of individuals who use private services. It was also believed that the current pattern of diseases in Saudi Arabia can be managed appropriately in PHCCs, which, if implemented would minimise the operation and economic burdens on

hospitals by decreasing waiting lists and decreasing utilisation of health resources. However, participants highlighted that achieving these benefits requires empowering the PHCCs' role, allocating appropriate budgets, investing in human resources and capitalising on current resources and infrastructure.

We need to reinforce the role of primary health care. The role of PHCCs is very crucial. We need to reinforce it in terms of manpower, budgeting and infrastructure. This is very important (Interview 18, Female, Regulatory Body).

Among the primary healthcare services, health promotion and disease prevention were considered by most participants as the most urgent healthcare need. Rather than treating diseases, participants thought primary interventions and community outreach programmes to prevent diseases or detect them in early stages as a cost-effective measure to minimise disease progression, and costs related to hospitalisation and advanced cases treatment. Participants cited the lack of health education initiatives and public awareness about NCDs and associated risk factors have contributed to the high prevalence of these diseases in the Saudi population.

Society needs to be educated about (NCDs) diseases. Patients are unfortunately unaware of their illnesses. For example, a patient may have thyroid disease, I would not be exaggerating to say that the number of thyroid patients as a rough estimate could reach as many as 1 million patients, (I am sure that) patients who know about their illness and actually go to hospitals for treatment may not exceed 150, 000 patients. (Interview 7, Male, Pharmaceutical industry).

A few suggested a community-based healthcare approach to extend the current model of service delivery and expand outreach health education initiatives to a wider population. The convenience of community-based healthcare was thought to facilitate access to both curative and preventive care services, especially for the elderly population.

People in Saudi Arabia need to have better access to quality care, a system that focuses on the population's needs of wellness and prevention, community-oriented health care. We need to have healthcare delivery to them, I mean near to where they are located and to make the healthy choice the easiest and the best choice for everyone, through policy, through the infrastructure, the social change, all of these things. (Interview 8, Male, Regulatory Body).

4.5.1.1.3.2 Localised workforce

Localisation (or Saudisation) of the health workforce was seen by most of the participants as a health system need. Participants believed that the Saudisation of the health workforce is national security of such an important health resource against any political instabilities or natural or health disasters. A participant from regulatory body reported a previous experience in which the sudden efflux of foreign healthcare workers caused an acute problem:

During the (second) Gulf War, most foreigners (working in my hospital) left the country, only a minority stayed. Therefore, we (health system) should secure the health care providers from our own people; we should invest in our people, it is national security (Interview 1, Male, Regulatory Body).

Localising the workforce was perceived as important by the participants for the continuity and stability of care service provision, as Saudisation would maximise the continuity of employment and minimise turnover rates. It was also thought that the Saudisation of healthcare professionals would help to overcome language, social and cultural barriers. However, participants stressed that quality is as important as the quantity of the workforce and highlighted the importance of planning workforce supply and demands based on the needs of the labour market to guide education as well as the number and specialities required to replace the current expatriate workforce. Reflecting on the need to activate primary care services, there is a demand for General Practitioners, Family Medicine and nurses to fulfil the roles required to activate and empower PHCCs' role in the health system. The current

2030 Vision strategies to reform the labour market by increasing job opportunities for Saudi nationals and improving education and training opportunities to increase the capacity and skills of Saudi professionals were believed to accelerate health workforce localisation.

4.5.1.1.3.3 Localised medicines

Similarly, the localisation of pharmaceutical manufacturing was perceived by the participants as national security against any political or supply chain instabilities. Despite not being an urgent need, participants considered securing the supply of medications through local manufacturing as a critical healthcare need requiring a long-term plan to ensure a sustainable supply of medicines. Some participants believed that local manufacturing is important to secure independent and feasible access to medicines, which consequently will minimise the current shortage as well as potential shortages or disruptions of supply chains in the future.

[It is a] public security from a government, the country needs to have self-dependent access to the medications, especially during a crisis or (wars). [We] cannot rely on all medications coming from abroad (Interview 12, Male, Pharmaceutical industry).

Some participants vented their frustrations regarding the limited role of local manufacturers in generic medicines production only and stressed the need to localise the manufacturing of essential medicines, especially those of high and continuing use and demand in the Saudi pharmaceutical market, such as medications for NCDs.

How many essential medicines will a patient be cut off if they are not available? Let us talk about thyroxine which is manufactured by a foreign country, what would happen if a problem occurred preventing the arrival of the medicine into the country? How are we going to make thyroxine available? Interferon and insulin. Insulin, for example, where are we going to get it from? (Interview 7, Male, Pharmaceutical industry).

4.5.1.2 Pharmacy related

This theme captures the view of the professional participants about the current roles of pharmacists and to what extent current services are meeting consumers' needs and expectations. It also provides insights into how pharmacy services could extend the capacity of the health system and increase access to primary care services and medication advice.

4.5.1.2.1 Current roles and practices

Medication dispensing was identified as the current key role of pharmacists working in hospitals and community pharmacies. Although participants also reported other activities such as medication counselling, supply chain, inventory management and clinical responsibilities (for some pharmacists with advanced degrees in large hospitals), they were frustrated about the current dominant role of pharmacists in medication dispensing and described it as limiting their potential and capabilities to "small" and "secondary" roles. However, most participants reported that pharmacists perceive their role as mainly medication dispensing.

Pharmacists right now think that they should stay behind the window counting tablets to give to the patients. This is not actually the role of a pharmacist. It is more likely to be a technician's job. Pharmacists can have a role in counselling patients with the healthcare team rather than just counting tablets. Pharmacists need to change the view of what they are needed for. (Interview 1, Male, Regulatory Body).

Education and training issues as well as the professional background of non-Saudi pharmacists who come from medication dispensing-only practice were cited as reasons for this perception. Participants also reported that the current scope of pharmacy practice in Saudi Arabia is hospital focused and that other areas of practice have received less attention from pharmacy leadership and legislation in the last decades. In fact, community pharmacy particularly was described as a "forgotten area of practice".

Community pharmacy, unfortunately, was missed or forgotten for a long time. It was forgotten by pharmacy schools, stakeholders and legal agencies here (Interview 23, Male, Hospital).

Participants reported that this was due to community pharmacies being privately owned, therefore, health and pharmacy regulators considered it as a commercial business rather than a healthcare institution with a potential to provide services within the health system.

I think community pharmacy was driven for a long period of time as a trade business, so it was looked at as a business. It was not looked at as a provider of healthcare. (Interview 11, Male, Professional Body).

Two participants cited that the hospital and clinical professional background of most pharmacy policymakers might have influenced the scope of practice and education to be hospital focused.

I believe this is because most pharmacy decision-makers went to the United States and enrolled in clinical pharmacy programmes where they are totally out of the community pharmacies. They are all concentrating on the hospital pharmacy, especially the clinical part (Interview 1, Male, Regulatory Body).

One participant reported the limited number of Saudi pharmacists in the 1980s and 1990s made governmental employment organisations direct Saudi graduates towards hospitals of the governmental sector rather than community pharmacies of the private sector. The participants agreed, however, that the background of policy makers has influenced the focus of undergraduate and postgraduate education and training opportunities with hospital-focused knowledge, skills and expertise. As a result, some participants thought the attention provided to hospitals by pharmacy leadership helped to develop and define the role and responsibilities of pharmacists in hospitals compared to community pharmacies where the roles, responsibilities, scope of practice and legislation were underdeveloped.

4.5.1.2.2 Current initial education

This was an emergent theme raised by the professionals when discussing the country's needs of pharmacists and pharmaceutical services. Participants reported a gap between initial education and actual practice and thought that current education does not prepare graduates for the needs of current practice, citing the gaps in the educational programme, curricular content, academic capacity and quality assurance measures.

4.5.1.2.2.1 Transformation to PharmD

There were varied views about the transformation of the educational programme in most schools from BPharm to PharmD. Participants from hospitals and community pharmacies viewed the increased number of pharmacy schools transforming to PharmD was appropriate and fulfilling the need for a clinical-oriented entry-level degree. This transformation was thought to advance pharmacy practice towards pharmaceutical care and qualify graduates with the knowledge and skills required to provide patient-oriented pharmaceutical services.

A few participants, however, described the transformation to PharmD as not built on effective workforce planning strategies. The lack of clear and specific roles and responsibilities for PharmD and BPharm graduates within the health system was believed to have forced graduates of both programmes to perform the same jobs. Several participants highlighted that this transformation might be inconsistent as there is a mismatch between what students are taught in school and what they implement in practice. A participant from academia commented:

We teach [students] that you are clinical pharmacists, you will work with the physician, the physician will ask you about medication, you are the medication consultant, but when they graduate, they do not see it in practice (Interview 3, Female, Academia).

The limited clinical roles of pharmacists to large hospitals and the lack of such roles in other pharmacy settings were believed to contribute to the mismatch between

graduates' job expectations and fulfilment. The non-readiness of the practice to accommodate and integrate PharmD graduates within the health system was reported to cause a struggle between what they practice and what they were taught at school.

The quality of the transformation from BPharm to PharmD was another area of concern. A few participants reported that the transformation in most schools is not real nor reflects the clinical content to fulfil the requirement of PharmD as a clinical-oriented degree. The non-effective transformation to PharmD was cited as the reason for not equipping the students with effective clinical-based skills and knowledge.

If you are teaching PharmD (programme) you can find that their curriculum is not reflecting (real) PharmD. They teach four courses of Medicinal Chemistry and four courses of Microbiology; this is a BPharm, not a PharmD programme (Interview 13, Male, Regulatory Body).

If you are going to have a scale of 100 to measure to what extent a school has a PharmD programme, the best you have will be about 60, but others no, it is very low, they do not have a PharmD programme (Interview 21, Male, Professional Body).

Even more strongly, and of some concern, participants from the pharmaceutical industry opposed the transformation to PharmD as the graduates did not have the basic knowledge and skills required to join this area of practice such as medicinal chemistry, quality control standards and medicinal formulations of products. This transformation created a gap between initial education and the practice of the pharmaceutical industry where job opportunities are available but occupied by expatriates due to the shortage of native pharmacists with the required skills and expertise.

I think that one of the biggest gaps happened in the last 10 years when almost all pharmacy schools stopped BPharm and moved to

PharmD, so students were not exposed to topics related to pharmaceutics, manufacturing, analytical chemistry and so on. As [regulatory body], we hear feedback from our colleagues from the pharmaceutical industry saying that the graduates have minimum information related to the work of manufacturers (Interview 16, Male, Regulatory Body).

They suggested that some schools should continue to teach BPharm to address the needs of the pharmaceutical industry, especially those located near pharmaceutical manufacturers. They also suggested adding core rotations within the PharmD programme in the pharmaceutical industry to expose students to other areas of practice where clinical roles within medical departments of the companies or manufacturers could utilise PharmD graduates.

4.5.1.2.2.2 Curricular scope and content

There was a consensus that the scope of the current curriculum in most schools focussed on hospital pharmacy practice whilst neglecting other areas of pharmacy practice. Some explained that the focus of the curriculum on hospitals was responding to the previous labour market needs for local pharmacists to work mainly in hospitals, yet they felt that the hospital-focused curriculum cultivated the "hospital mind-set" in graduates whereby work opportunities in hospitals are perceived as better than in other areas, such as community pharmacy or pharmaceutical industry. Some participants believed that curricular scope may have prompted graduates to believe that they must work in hospitals for a stable career path and any other work opportunity is considered a stepping-stone to the preferred and permanent job in hospitals.

Saudi graduates tend to go to a hospital thinking that this is the best opportunity that they could have and consider working in community pharmacy because they did not have [a job] yet in a hospital (Interview 17, Female, Community Pharmacy).

Many thought that the instructional content of the curricula qualified graduates to be ready and confident to practise in hospitals compared to other areas of practice where knowledge and skills gaps were noted from graduates. Besides dedicated education, participants from the community pharmacy and pharmaceutical industry cited the limited focus of experiential training to hospitals have limited the exposure of graduates to other areas and contributed to the skills gap and reluctance to join areas other than hospitals. Of interest, participants from the pharmaceutical industry believed that the limited or no exposure of students to the pharmaceutical industry is the main reason behind graduates not considering this area of practice as a career option.

You went to school, I went to school, and we are all of the mindset to work in hospitals. No one says when you graduate you can work in the pharmaceutical industry (Interview 12, Male, Pharmaceutical Industry).

Our graduates are not ready [to join community pharmacy or industry]. If you screen all 30 schools (you will find) only three or four schools have a core rotation in community pharmacy and the remaining have not. They just graduate with zero experience in these settings (Interview 23, Male, Hospital).

There was a consensus that keeping the same previous focus in the current curricula is not matching or prepare the graduates to fulfil the current labour market needs. Many participants expressed their frustration about the existing gap between education and practice, describing the instructional content of current curricula as lagging behind and not coping with the current changing of roles in community pharmacy and highlighting the pharmaceutical industry's needs.

I think the curriculum of most of our schools was designed in the past based on the past needs [to work in hospitals]. But now, the need is not anymore a need. Therefore, our graduates [now] are usually ready [to work in] hospitals and need too much training to join a community pharmacy (Interview 23, Male, Hospital).

Participants' highlighted skills that are not taught in current curricula yet are required to practise in community pharmacy and the pharmaceutical industry. Communication skills, marketing and management skills, interprofessional collaboration skills, supply chain and procurement skills, skills in health technology and digital information solutions and skills of lifelong learning and development were highlighted as required for community pharmacy practice, whereas research and development, marketing and product formulations skills were highlighted as required for pharmaceutical industry practice. Importantly, participants from community pharmacies cited the lack of community practice skills, communication skills in particular, as the main reason for the preference of community pharmacy owners to recruit non-Saudi pharmacists.

The confidence of Saudi pharmacists to communicate with patients is weak. [Because] they were not exposed to the market. They need time [to adjust] and be ready. Most non-Saudis have two years of experience in their home countries (Interview 10, Male, Community Pharmacy).

However, participants from academia mentioned that some schools recognised the existing gap and are currently undertaking changes to the curricula to add new content related to community pharmacy and the pharmaceutical industry. They believed that these new courses are yet insufficient and lacked the required depth and details compared to those focused on hospital practice and that these changes are not common across all schools. Many participants believed that curricula should offer various pharmacy career options, such as health technology, supply chain and health insurance for the students to explore and develop interests to practise beyond the traditional roles in hospitals, community pharmacies and the pharmaceutical industry.

4.5.1.2.2.3 Number of schools and academic capacity

The rapid growth of pharmacy schools over the last decade in Saudi Arabia was perceived by some participants as a positive move to assist in the production of native pharmacists. However, some expressed their concerns that the rapid growth

of schools within a relatively short time might have affected the quality of graduates as many new schools faced challenges to recruit the adequate quantity and quality of academic faculty and teaching practitioners. The limited capacity of training sites, including hospitals and community pharmacies, was also reported to be another challenge, especially for schools located in rural areas and those in main cities where there was a competition between the available training sites. Many participants believed that this could have contributed to the gap in some skills such as communication skills and interprofessional collaboration in graduates due to the limited opportunities to develop these skills during training.

Most pharmacy schools are located in rural areas so they do not have resources (training sites) compared to Jeddah, Riyadh and Dammam. If they want to send their students to a pharmaceutical company, for example, the nearest one is around 300 kilometres! (Interview 23, Male, Hospital).

Some pharmacy schools have no hospital next to them, hundreds of kilos away from them, so how will they train their graduates? (Interview 11, Male, Professional Body).

The limited number of teaching practitioners was also considered by some to have created a gap between education and practice. The participants believed that in a clinically oriented degree such as PharmD it is important to involve teaching practitioners in the education otherwise education would be theoretical based not linking the dynamic changes of practice, changing guidelines, real-life scenarios and patient expectations into the curriculum. To solve the shortage of teaching practitioners, many participants suggested the move of full-time academics with clinical backgrounds to part-time ones like other professions such as medicine.

Some of the twenty-eight schools are PharmD programmes and do not have even a practice site! The same faculty who are teaching basic science teach therapeutics! (Interview 21, Male, Professional Body).

We should encourage pharmacy academic staff to be practitioners similar to the staff in medical schools. Go to any School of Medicine, you will see that is very clear. I think if we (in pharmacy) adapt the medical school experience, it will be an excellent opportunity for pharmacy (education) to improve (Interview 15, Male, Hospital).

4.5.1.2.2.4 Quality assurance measures

Some participants believed that there are insufficient measures, procedures and frameworks to assure the quality of educational outcomes in Saudi Arabia and that national accreditation must play a significant role in assuring the quality of instructional content and experiential training of local curricula in all schools. One participant from an accreditation body described that the slow movement of governmental schools towards local accreditation is because national accreditation is not a mandatory requirement for graduates' registration nor for receiving governmental funds. The participant also described obtaining local accreditation is more difficult than international accreditation due to the need to achieve certain standards and quality management measures in the curricula to obtain local accreditation.

The introduction of SPLE (the licensure exam) by the SCFHS was considered by several participants as an important step to assure the minimum requirement of quality in graduates. Many participants, however, considered SPLE alone is not enough to unify graduates' practice expectations nor to ensure consistent performance in practice. A few participants highlighted the need to develop a national competency framework based on the labour market needs would unify expectations from graduates rather than relying on educational institutions to develop their curricula based on what they perceive is needed in the labour market.

I think we are missing unified practice expectations in Saudi Arabia. Currently, it is just left for individuals (in education) to decide what is critical for them to provide to the patients (Interview 11, Male, Professional Body). Importantly, it was believed that unified competencies will help guide education development and minimise the skill gaps among graduates when they start practising.

4.5.1.2.3 Pharmaceutical service needs

This theme captures the view of the professional participants about the roles and services required to address the societal needs of pharmacists. Diversification of pharmacists' roles, in both direct and non-direct care, was identified as being able to stimulate the growth of the profession beyond hospital-centred pharmacy practice to address the country's needs of pharmacists.

4.5.1.2.3.1 Expanded roles

All participant agreed that expanding the roles of pharmacists beyond medication dispensing is necessary to advance the profession. Provision of care services was highlighted a key missing role for pharmacists in community pharmacies and PHCCs. Roles in the pharmaceutical industry, health technology, health economics, health insurance, health service research, procurement and supply chains were also reported as missing opportunities for pharmacists in Saudi Arabia. Most participants believed that the expansion of roles would promote the profession and enhance its presence so that it would become recognised as a profession with an impact on healthcare outcomes among regulators and policymakers, other healthcare professionals and the public. Importantly, several participants believed that there is an inevitable transformation of medication dispensing roles to automated robotic prescription-filling devices which require pharmacists to expand their roles beyond just medication dispensing, otherwise the need for them will disappear.

The challenge that we are facing now is that some pharmacists feel they are just responsible for (medication) dispensing. This role is going to disappear, automation can do the job. If pharmacists continue thinking that way, I think in the next few years the health system will not need them (Interview 11, Male, Professional Body).

There was also the belief that the expansion of roles, especially in the pharmaceutical industry and community pharmacy, is fulfilling the country's 2030 Vision needs from pharmacists to localise the manufacturing of medicines and empower the role of primary care services in community pharmacy. Some participants also believed that expansion of roles is required to reduce the current unemployment rate among graduates by creating new and more job opportunities for them beyond hospital job opportunities only.

4.5.1.2.3.2 Patient-centred services

There was agreement among all participants that the current need for pharmaceutical services is the provision of patient-centred services in both hospitals and community pharmacies. Medication counselling, medication reconciliation, health promotion and disease prevention, vaccination, minor illnesses consultations, management and monitoring of NCDs were suggested as key care services which can be provided by pharmacists in Saudi Arabia.

The role of dispensing medication to the patient needs to be improved and the role of pharmacists needs to expand. They should be involved in educating the patient, sitting with the patient, educating physicians, and challenging their decision (Interview 8, Male, Regulatory Body).

Many participants believed that the provision of patient-centred services would fulfil the public needs from pharmaceutical services, specifically medication counselling and education which are currently not provided appropriately by pharmacists. Several participants thought that this would enhance the public's perception of the pharmacist as a care provider and a member of the healthcare team with distinguished capabilities and expertise in medication aspects rather than the image of a medication seller only. Not least participants thought that the provision of patient-centred services would help to effectively utilise the capabilities of PharmD graduates in care provision services rather than on medication dispensing services only and would also help to enhance pharmacists' job satisfaction.

4.5.1.2.3.3 Community-based practice

There was a consensus that the current hospital-focused practice is not responding to the current challenges and needs of the health system and population. Most participants believed that community pharmacies are an ideal healthcare institution to extend the capacity of the health system and provide services that are accessible and convenient to the public. In addition to PHCCs, the provision of primary care services in community pharmacies was seen by many participants to help to minimise hospital overcrowding and minimise the financial burden on the health system. Visiting a community pharmacy for a minor illness consultation could be also cost-effective for individuals who cannot afford consultation in a private polyclinic or hospital.

People believe that pharmacists have the knowledge, and nowadays because it is expensive to go to a consultant and pay 300 or 500 Saudi Riyal, people will go to a community pharmacy directly. It is a cost issue (Interview 14, Academia, Male).

Several participants reported that the management and monitoring of NCDs in an accessible and convenient setting, such as a community pharmacy, could enhance patients' continuity of care and medication adherence, thereby limiting hospital visits to acute and complicated cases only instead of merely monitoring cases.

We need to have more services in community pharmacies. For example, if I use warfarin, I will need a pharmacist to explain it to me, to check my INR. Why must I have a hospital appointment after two months (just) to (monitor) my INR? Why must I drive one hour there and back to the hospital? Why can I not go to any community pharmacy to get my INR checked there? (Interview 20, Male, Hospital).

The provision of health promotion and disease prevention programmes in community pharmacies was regarded by some to help to access and outreach wider groups of the population more conveniently than in traditional ways in shopping

malls or hospitals. This was thought to help to achieve the country's 2030 health strategy of health promotion and disease prevention and maximising its outreach. Due to its outreach and accessibility to the public, there was a strong belief among some participants that the provision of pharmaceutical care services in community pharmacies would help to promote pharmacists as care providers thereby enhancing the image and recognition of pharmacists' role and presence.

We (pharmacists) are missing our presence in the best place to see the highest number of patients ever, in community pharmacies, where there is no physician! So the more pharmacists are there, ready, equipped with knowledge and skills, we (pharmacists) can provide real patient care and prove our presence (Interview 21, Male, Professional Body).

4.5.1.2.4 Facilitators and barriers of roles expansion in community pharmacies

Participants described key enablers and barriers they perceive could influence the expansion of roles and services of pharmacists in community pharmacy. They highlighted policy change and organisational support, education and training, and pharmacy sector collaboration as enabling factors to role expansion, whereas organisational and legislative issues, pharmacist-physician collaboration, and public and regulators' perception of pharmacists were perceived as barriers to role expansion.

4.5.1.2.4.1 Policy change and organisation support

The recent transformation of health policy to allow pharmaceutical care services in community pharmacies was identified as one of the important enablers of practice change and professional advancement. Participants considered this as an opportunity for pharmacists to be recognised as healthcare providers and medication advisers. It was also perceived that this will attract a local workforce, especially PharmD graduates, to work in community pharmacies and use their clinical skills. The MOH's "Wasfaty" initiative to dispense prescribed medicines from community pharmacies was believed to enhance the engagement of community

pharmacies as healthcare venues within the health system. The promotion and marketing of pharmacists' new roles and services by regulatory bodies and professional organisations using social and general media were believed to encourage doctors to refer patients and patients to seek and utilise these services.

MOH, TV, advertisements and any other means could enhance community awareness about pharmacists that they are entitled to provide consultancies, instructions and all stuff related to medication, for they are no less than doctors are! (Interview 24, Male, Community Pharmacy).

4.5.1.2.4.2 Education and training

Most participants strongly believed that setting up initial education, CPD and CE strategies would enable the expansion of the roles in community pharmacy to be delivered appropriately by pre and in-service pharmacists. Participants highlighted that developing initial education and professional development activities will help pharmacists to acquire specific clinical and professional personal competencies required to perform effectively in community practice settings where there will be more interaction with patients and healthcare professionals as well as provision of pharmaceutical interventions and recommendations. It was also believed that developing initial education with needs-based competencies would prepare and qualify graduates with the competencies required to be practice ready to perform effectively and fulfil their expectations in actual practice.

We need to take education issues seriously and work to improve them and keep them up to date. We need to make sure that our pharmacist knows what to do when they are actually on the ground, so they do not just get surprised that now I am in a community pharmacy and I really need to learn and need to do those things (Interview 17, Female, Community Pharmacy).

Developing CPD and CE activities were seen as crucial to enable role expansion by in-service pharmacists, especially since most community pharmacists are non-Saudi

and come from countries where clinical education and training are almost lacking. Several participants thought that the availability of residency programmes in community pharmacy practice as well as certified training courses in vaccination, patient education, and monitoring of chronic diseases would encourage community pharmacists to enrol and expand their expertise to the new roles and services.

4.5.1.2.4.3 Pharmacy sectors collaboration

There was a strong belief that collaboration between pharmacy leadership and professional bodies, governmental agencies, and educational institutions is crucial to advance the profession and enable practice transition to be community pharmacy centred.

They believed that collaborative efforts are required to identify pharmacist roles, define professional scope and standards of practice, define practice expectations from pharmacists and set a future vision to direct the profession advancement.

I think we are missing a general direction of pharmacy practice in Saudi Arabia. Pharmacy education, pharmacy practice, hospital Pharmacy and regulators are not working together, everybody is working on their own. I think it is not an individual institution that could come up with that, I think all pharmacy leaders should start thinking of the role to change and enforce it because it is not going to happen just by an individual's efforts rather it is an organization's effort (Interview 11, Male, Professional Body).

Workforce planning was also thought important to be considered by all relevant sectors to inform and direct the need and supply of pharmacists based on the labour market needs.

4.5.1.2.4.4 Legislative and organisational issues

Despite the recent changes in MOH regulations to allow the provision of care services in community pharmacies, some participants described a lack of tools to enable role expansion. For example, the lack of standing operating procedures to

guide the development, implementation and standardisation of these services in community pharmacies. The lack of patients' medical profiles and drug information software to review medication history and support health decision-making as well as was private areas for consultations were also reported as barriers for roles expansion. Some also mentioned that the shortage of pharmacists and not freeing them from administrative and selling tasks are limiting community pharmacists performing the new responsibilities.

Pharmacists are overwhelmed. They encounter hundreds of patients in one shift. They lack training and supervision, and they are not empowered with a decision support system at work (Interview 8, Male, Regulatory Body).

4.5.1.2.4.5 Pharmacist-physician collaboration

Several participants thought that doctors' attitudes towards pharmacists might be an obstacle to the expansion of pharmacist roles. Some reported that doctors perceive medication dispensing as the only role of pharmacists. They suggested that doctors from countries where the only role of pharmacists is dispensing might not be aware of pharmacists' potential to provide care roles compared to those who studied or trained in developed countries where care provision roles of pharmacists exist. The lack of interprofessional collaboration, referral mechanisms, and communication channels between pharmacists and physicians was also thought to limit the expansion of roles and make the execution of integrated care and teamwork difficult.

4.5.1.2.4.6 Public perceptions of pharmacists

Most participants believed that the public perception of community pharmacists as "medication sellers" and community pharmacies as a "drug market" for the supply of medicines, cosmetics and food supplements might present a barrier to accepting and utilising the new roles of pharmacists. Lack of detailed medication counselling, interaction and engagement of pharmacists with the public as well as the business nature of community pharmacies were believed to contribute to developing and

deepening the perceptions of pharmacists as "medication sellers" as well as the lack of care services. Several participants thought that the public trusted physicians more than pharmacists in the provision of medication-related information or advice.

People see pharmacists as medication sellers... because (pharmacists) just draught medication from the shelf and put it in a bag with no clear instructions and give it to them. (Pharmacists) are not doing their job right such as counselling, drug-drug interactions, and asking some questions about allergies, weight, height, and age of patients (Interview 22, Male, Hospital).

However, others believed that there is trust and respect for pharmacists being "medication experts", with a few participants considering that the public sees pharmacists as comparable or better than physicians in all aspects related to medication information or advice.

4.5.1.2.4.7 Regulators perceptions of pharmacists

Many participants believed that the current limited views of health regulators toward pharmacists might limit the expansion of pharmacists' roles, because they perceive medication dispensing as the only role of pharmacists within the health system. The participants explained that the dependence of the health system on physicians as key care providers might have contributed to their lack of awareness of other healthcare professionals' potential, such as pharmacists or nurses, to provide this role, hence, minimise the burden on physicians. Some participants also thought the limited representation of pharmacists within health decision-making and regulation for a long time might have limited the expansion of roles beyond medication dispensing.

Unfortunately, very few pharmacists have reached a higher level of decision-making unlike now where pharmacists get more involved, especially with the new vision (Interview 19, Male, Hospital).

Some, however, reported an increasing representation of pharmacists in health decision-making and regulation currently and thought that would advance the profession and maximise its impact within the health system.

4.5.2 Findings from the public focus groups

Two overarching themes were identified representing societal healthcare needs to public participants: health system related and pharmacy profession related. Figure 4.3 illustrates the overarching themes with their associated themes and subthemes, which I will now discuss.

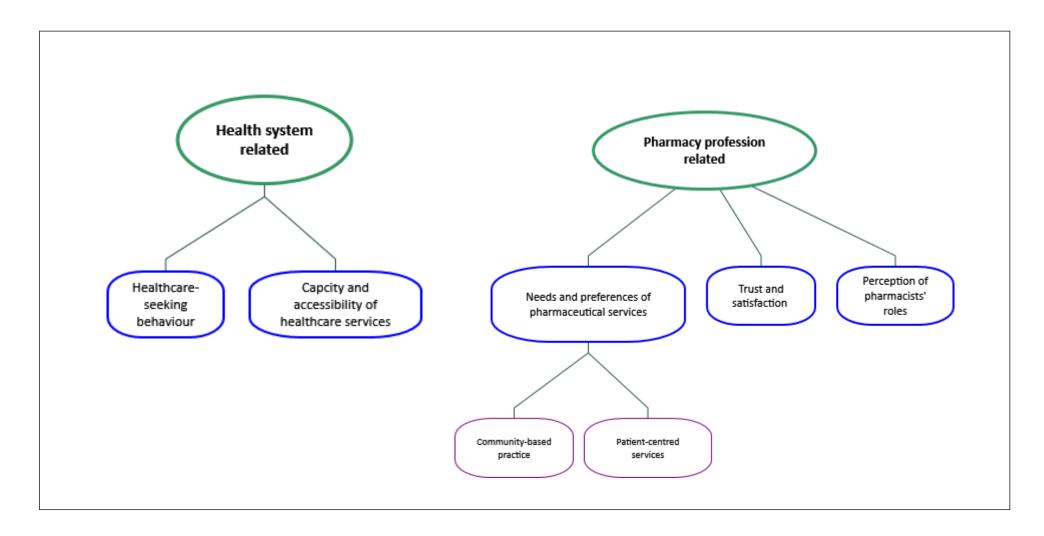


Figure 4.3: Findings from the public focus groups

4.5.2.1 Health system related

This theme captures the views of the general public participants about health system services and to what extent they think they meet their needs and expectations. It also describes several healthcare-seeking behaviours and provides insights into their and others' healthcare needs and expectations of health services.

4.5.2.1.1 Healthcare-seeking behaviour

The focus group discussions revealed a range of health beliefs and health-seeking behaviours. Most participants appeared to trust governmental health institutions overall more than private health institutions given the business-oriented nature of the private institutions. Within governmental health institutions, most participants expressed the trust and preference to seek healthcare in hospitals rather than PHCCs because of better facilities, equipment, accessibility, specialities, and services. Within PHCCs, most participants appeared not to fully trust general practitioners and viewed them as less competent and trustworthy than family medicine specialists. The overcrowding and long waiting times in hospitals, however, prompted most respondents to seek healthcare in private institutions, particularly for minor illnesses, despite being costly and less trustworthy than governmental hospitals.

It is not a matter of distrust (in governmental hospitals) but patients need to get treated as soon as possible, so they are forced to go to the private sector. Other than this, they would go to government hospitals since Saudi physicians have proven their competence. I am talking about the duration, it is important for some medical cases to be diagnosed and treated rapidly rather than waiting for a long period of time (Focus group 6, Male, Dammam).

Importantly, it was noted that several participants were not aware of services provided or health conditions that could be treated in PHCCs. They reported hospitals as the only healthcare venue they seek healthcare in. The lack of promotion by the MOH in general and social media about PHCCs as the gateway to

the health system was thought to have contributed to the lack of awareness about the role and services of PHCCs. A participant commented:

I noticed that many people do not know what PHCCs are really for.

When should we go there? When do we need to go there? What
services do they provide, regardless of their shortage of many
services, I need to know what they provide. We even do not know
their locations! (Focus group 3, Male, Makkah).

4.5.2.1.2 Capacity and accessibility of healthcare services

There was a general dissatisfaction among the public participants about the current capacity, accessibility and delivery of health services in governmental health institutions.

Regarding hospitals, respondents from Tabuk and Jazan provinces mentioned their dissatisfaction with the limited available health resources in their cities. Of note, the participants cited the limited availability of resources as the main reason for them to frequently travel to hospitals in major cities, such as Riyadh or Jeddah, or to neighbouring countries to seek specialised health services. One participant commented:

The specialist centres are only found in the main cities, and some of these cities have perhaps three, four, or five specialist centres while Jazan has none. Therefore, flights (travelling to Riyadh) are full of patients (Focus Group 2, Male, Jazan).

Participants from Riyadh, Makkah and Dammam provinces reported their dissatisfaction with hospitals in terms of the number of hospitals and long waiting lists. They cited that the number of hospitals and the service capacity do not match the demands of the high population in these cities. The capacity of home healthcare services was an area of concern to some participants as the current capacity of home healthcare services is not coping with the increased elderly population in these cities.

The population of Riyadh is about 7 million, but there are only 5 or 6 government hospitals! The available number of hospitals is less than what is required (Focus Group 7, Male, Riyadh).

The availability of medicines in governmental health institutions was another area of dissatisfaction for all participants. Several participants mentioned the shortage of medicines in hospitals and PHCCs, especially those for chronic conditions have contributed to their frequent visits to hospitals for medication refills. Some participants, however, reported their preference to buy their medicines from the nearest community pharmacies, despite being costly, to minimise the number of hospital visits and avoid long waiting times.

It has been almost 2 months now since my father took his last cholesterol medications. Every time I go to the PHCC, they refer me to another PHCC where it is also not available there, even in the hospital (Focus group 3, Male, Makkah).

Hospitals dispense a one-month supply of medication only! but because I need a large quantity and it is difficult for me to go to the hospital every month, I purchase them (Focus group 1, Female, Tabuk).

Regarding PHCCs, the capacity of services and resources caused dissatisfaction.

Several participants reported the provision of chronic disease management in

PHCCs does not cover all NCDs which has led people to seek health care in hospitals.

PHCCs are treating diabetes and hypertension only! Asthma and other (chronic diseases) are not treated in the PHCCs! (Focus Group 2, Male, Jazan).

The treatment of common diseases and minor illnesses in PHCCs was reported to be unsatisfactory and often they were referred to associated governmental hospitals. Some participants reported the preference to visit governmental hospitals directly due to better laboratory facilities, diagnostic equipment and available specialities compared to PHCCs. Moreover, some participants expressed their disappointment

in the limited role of PHCCs in the provision of focused outreach health education and disease prevention programmes to houses, schools and workplaces. The lack of such programmes was seen as the cause of the current unhealthy habits and chronic diseases among the population. One participant commented:

There is not enough health awareness (programmes). All entities, MOH, schools... they all have to cooperate. The more a person is educated, the more he or she knows, and the more likely they will avoid harmful things. For example, kids will continue consuming sugar if they do not know its harmful effects but if they have enough awareness provided by school, family or ads, they will avoid consuming lots of sugar (Focus Group 5, Female, Dammam).

Participants also reported the relative inaccessibility to PHCCs compared to government hospitals and private health institutions due to fixed working hours, limited available appointments and some difficulties in booking appointments, especially the electronic booking platforms for elderly patients. A limited number of participants, on the other hand, reported positive experiences with PHCCs services where quality resources, facilities and services exist. However, these PHCCs were described as few with limited capacity and accessibility due to the overcrowding serving multiple neighbourhoods.

We have this distinguished big PHCC at (...neighbourhood) but the problem is it is overcrowded because it covers 3 or 4 neighbourhoods. The building is big, the quality there is distinguished, the medical team are excellent, the management is good, and medications are available, but the problem is the crowding. People come from other neighbourhoods because they do not have their own PHCC. They all pile up at our PHCC (Focus group 6, Male, Dammam).

Nonetheless, most participants reported private health institutions overall to have better health resources, service delivery and accessibility than governmental institutions. Despite being expensive and less trustworthy than governmental

health institutions, the participants reported utilising private healthcare to avoid issues of overcrowding and long hospital waiting times and issues of accessibility and resources in PHCCs.

4.5.2.2 Pharmacy related

This theme captures the view of the general public about pharmacists' roles and to what extent current services are satisfactory and meet their needs and expectations of pharmaceutical services. In this theme, particular attention to the role of pharmacists in community pharmacy was noted by all participants. To the participants, community pharmacy was perceived as an interface of the pharmacy profession in Saudi Arabia.

4.5.2.2.1 Perception of pharmacists' roles

Most participants viewed the role of pharmacists in Saudi Arabia, either in hospitals or community pharmacies, as merely concerned with medication dispensing. Participants sought help from community pharmacists in all queries related to medications rather than hospital pharmacists where interaction with them was mainly related to medication supply. Visits to community pharmacies were also made for consultations regarding minor illnesses or for buying over-the-counter medicines, cosmetics, food supplements and home medical and personal hygiene products.

When my kids catch the flu, I do not take them to a hospital, instead, my husband purchases the medications from a (community) pharmacy where pharmacists give the right medication for their age (Focus group 1, Female, Tabuk).

Commercial pharmacies are not mainly pharmacies! They sell a lot of stuff such as baby products, cosmetics, hygiene kits, etc.

Commercial pharmacies contain the stuff we need, so we turn up to it (Focus group 2, Male, Jazan).

4.5.2.2.2 Trust and satisfaction

Participants appeared not to fully trust pharmacists, especially community pharmacists, regarding them as "sellers" because they work in commercial ventures. Participants thought that community pharmacists have no clinical skills because most of them do not ask about medical history, age, or weight and do not review the history of medications or other diseases they might have. Lack of communication and engagement with patients as well as lack of detailed medication counselling upon medication dispensing were key reasons for dissatisfaction with community pharmacists.

Few pharmacists tell you that some medications can interact with other medicines and cause side effects. Patients are ignorant about such information, so pharmacists should provide such information (Focus group 5, Female, Dammam).

The limited interaction and communication with patients as well as the lack of medication education and counselling provided by pharmacists led some participants to believe that workers in community pharmacies are not pharmacists therefore, they are not qualified to provide directions about medications.

Most pharmacists (in community pharmacies) are technicians, not pharmacists; they are not qualified even to give directions about medications, they cannot give much (Focus group 3, Male, Makkah).

Sometimes (workers in community pharmacies) are not pharmacists. In fact, if they are pharmacists or assistant pharmacists, there is no difference between them! They just assemble the medications and hand them to you, without any instruction, just a few words like take this medication once or twice, and then draw a line or two on the package. They do not offer direct instructions such as saying to take the medication twice, and that a problem will result if you stop taking it. You know, such instruction (Focus group 7, Male, Riyadh).

Several participants reported that some pharmacists, when asked questions regarding the dispensed medication, advised patients to go back to their doctor for information. This led them to distrust pharmacists. Interestingly, some participants perceived Saudi graduates as not confident about the information they provide on medications, so they were hesitant to trust recent graduates, as they were not viewed as knowledgeable.

Most pharmacists, especially fresh graduates lack experience. I do not know, maybe because of their education! They read the prescription with hesitation and concern, this indicates a lack of confidence, they cannot just read the prescription and gave instructions. (When I see them), I get sceptical, I have to go back to the physician for more clarification (Focus group 1, Female, Tabuk).

Some participants expressed their lack of trust in pharmacists compared with physicians even in aspects related to medications.

I believe that the physician has to give the medications, not the pharmacist who may give you a medication you know nothing about (Focus group 8, Female, Riyadh).

People always say do not take medications from pharmacists because they are just pharmacists. I feel sceptical about taking medications from pharmacists. If I am not able to get to the hospital, whatever the pharmacists say, and even if they give me medication, I do not trust them (Focus group 5, Female, Dammam).

However, other participants perceived community pharmacists as trustworthy and comparable to doctors in their knowledge and expertise of medications. Some participants reported the preference to seek help from community pharmacists in all medication enquiries and mild illnesses.

(Community pharmacist) is a replacement for the physician honestly. Most of the time he saved me from the trouble of going to the hospital. I always see his way of dealing with the customers, he always gets what I want even more than the physician, and he knows what he is doing. Any symptoms I have, I just go and tell him about them, stomachache, pain, fever (Focus group 4, Female, Makkah).

Participants also reported their dissatisfaction with the practice of hospital pharmacists due to the lack of detailed medication counselling on medication dispensing and described them as "invisible" given the limited communication with patients. One participant, however, reported an experience of detailed medication counselling in a hospital pharmacy and found them useful to be widely and continuously offered in hospital and community pharmacies.

My experience at the (... governmental hospital) was great. I went there for almost 12 years with my mother. The pharmacists there are so caring, one of them sat with me for like 13 minutes explaining everything (related to my mother's medications) in detail (Focus group 3, Male, Makkah).

Several female participants reported their dissatisfaction with the gender gap in community pharmacies and expressed the desire to have more female pharmacists in community pharmacies.

I never saw a female pharmacist in commercial pharmacies! I will be more comfortable dealing with a woman and explaining everything to her without being shy. I always ask my husband to tell the pharmacist what I feel, but it is not the same (Focus group 4, Female, Makkah).

4.5.2.2.3 Needs and preferences for pharmaceutical services

This theme captures the view of the participants about their needs and expectations of pharmaceutical services in the country. The findings under this theme highlighted the provision of patient-centred services in community pharmacies would fulfil their needs of pharmaceutical services.

4.5.2.3.1 Community-based practice

Most participants expressed their preference for community pharmacies over PHCCs and hospitals to receive healthcare services given the easy accessibility, and convenience to visit at any time due to the long opening hours and rapid service, with no appointments being required. Most were willing to utilise care services in community pharmacies if they were overseen by the MOH or any government agencies to assure credibility.

Private pharmacies are so easy to access unlike the government ones, which are difficult to access. They are also more convenient because, by the time I finish up my work, the government pharmacies close, so I cannot manage to get there on time, whereas (in private pharmacies) I can purchase my medication any time in the evening (Focus group 2, Male, Jazan).

Pharmacists in commercial pharmacies are express physicians! A physician without an appointment, when I feel sick, I ask him for medication, and then he gives it to me without a prescription (Focus group 3, Male, Makkah).

4.5.2.2.3.2 Patient-centred services

Most participants noted they had not witnessed care services provided in community pharmacies. Participants suggested monitoring and point-of-care tests, medication review, minor illnesses consultations, and therapeutic substitutions to be provided. Detailed medication counselling and medication advice were highlighted by all participants as the most needed services. The provision of these

services in community pharmacies was believed to enhance the overall image of pharmacists' as care providers rather than medication sellers.

The pharmacist's role is supposed to be smiling at patients, meeting them, and then describe the prescription very well. Many people do not understand medication instructions. A good pharmacist should identify the patients whether they are educated or not. They also should advise about medication alternatives and contradictory medications. The pharmacist should be aware of these points, and inform the patients about them, or ask them to go back to the physician because he or she might miss that point. This really makes the pharmacist smart (Focus group 7, Male, Riyadh).

Freeing pharmacists to provide care services only was believed to enhance the trust of community pharmacists.

I think pharmacists in commercial pharmacies should be spared from selling instead, pharmacists should provide medical consultancy, ask about your complaint, and offer a variety of brands so you can choose the best fit for you, they should give people medications and set the right dose. As for sales, pharmacies should hire some other people to do so (Focus group 5, Female, Dammam).

4.6 Key findings from phase 1

To our knowledge, this is the first study to explore the societal healthcare needs and roles required of pharmacists to meet those needs from the perspectives of policymakers, pharmacists and the general public in the Saudi context. This phase of the study identified perceived needs of the health system and pharmacist services and provided insights into the status of current initial pharmacy education and graduates' readiness to practise based on what the respondents perceived is currently needed in the labour market. It additionally suggested approaches to upgrade the pharmacy education model and curricula to be needs-based to fulfil the government plans and population needs of pharmacists.

Under the health system related overarching theme, two themes were common to both the professional and public respondents: healthcare-seeking behaviour and capacity and accessibility of health care. The uncertainty about the right healthcare facility to visit to seek help was a commonly reported behaviour among both groups, as well as the issues related to equity and efficiency of accessibility to health services. Under the pharmacy-related overarching theme, three themes were common to both groups: current roles and practices, patient-centred services and community-based practice. Both groups agreed that medication dispensing is the current key role of pharmacists and on the need for current pharmaceutical services to focus on patient-centred services in community pharmacies. Initial education was a theme identified by the professional respondents only.

4.6.1 Societal healthcare needs

The findings shed light on the capacity and responsiveness of the health system, describing the current capacity and delivery of care as not meeting the need for health services from the growing and ageing population as well as changing pattern of diseases. The inefficient distribution of health resources, especially hospitals, specialised services, and human resources, between main and rural cities was highlighted. This could be explained by the fact the distribution of health resources in the country is mainly linked to the population size rather than considering other important factors such as the health status and needs of the specific population in

each province (Al Saffer et al., 2021). Also, this could be related to the multiplicity of sectors that currently exist to provide health care services, which may have led to inefficiency and inadequacy in the distribution of health resources (Almalki et al., 2011; Almeman and Al-jedai, 2016).

The role of PHCCs within the health system was also a topic of dissatisfaction for both groups. Consistent with other studies, poor service provision, unavailability of basic health specialists, facilities, equipment and medicines in addition to long waiting times, fixed working hours and inefficient accessibility were the main reasons for dissatisfaction with PHCCs (Al Asmri et al., 2019; Al Saffer et al., 2021). The increasing focus on tertiary and secondary care hospitals and the decreasing investment in PHCCs along with the rapid population growth explains the inability of PHCCs to meet the increasing demand on health services in PHCCs (Al Asmri et al., 2019). The continuous demand for health services requires the health system to shift its focus back to primary preventive health services implemented in the 1970s, whereby diseases were prevented or minimised effectively and efficiently via primary care services (Almalki et al., 2011; Khoja et al., 2017; Al Asmri et al., 2019). By that, the main access point for primary care services for public health as well as acute and long-term conditions will be granted, and comprehensive health coverage to essential and quality health services will be attained (WHO, 2018). However, investment in primary care services is imperative to improve public health and lower health expenditure (Al Saffer et al., 2021). Extending the capacity of primary care services to more community-based care venues was suggested as means to increase the capacity and responsiveness of the health system to the increasing demand for health services.

The shortage of a local health workforce was a concern to the professional respondents. The low number of physicians and nurses, which is largely made up of expatriates, were perceived as creating instability within the primary workforce and threatening the sustainability of health service delivery and the resilience of the health system. However, the reforms of the Saudi Vision 2030 to increase job opportunities for Saudi nationals and set new regulations to replace expatriate

workers with Saudi citizens were believed to empower citizens and encourage students to enrol in health professions and provide a huge reserve of local health professionals.

The need to secure a sustainable source of medications through the localisation of the pharmaceutical industry was highlighted by the professional respondents as a healthcare need. Consistent with other studies, the lack of local medicines production was perceived as one of the main reasons for the recurring medicines shortage (Alruthia et al., 2018b; Tawfik et al., 2021). Localising the pharmaceutical industry is vital to maintaining health system resilience by limiting extreme increases in pharmaceuticals expenditure, ensuring affordability and accessibility of medicines, guaranteeing price stability, decreasing dependence on international supply chains and developing innovation and investments in pharmaceuticals production (Tawfik et al., 2021). In fact, the WHO suggested the localisation of pharmaceutical manufacturers to resolve the shortages of medicines in any country (WHO, 2015). While supply chains in Saudi Arabia are currently serving the needs for basic prescribed medications (WHO, 2013a; Almeman and Al-jedai, 2016; Tawfik et al., 2021), overdependence on drug imports in light of the lack of investment in local manufacturing and innovation prolongs drug shortage issues and puts patient care at risk (Alruthia et al., 2018b; Tawfik et al., 2021). This challenge, however, is recognised in the government's 2030 Vision reforms of the health sector. The government developed a strategic plan to encourage local and international investments in pharmaceutical production to localise 40% of the total drug market by 2030 (Saudi Vision 2030, 2017). However, sufficient infrastructure, skilled personnel, a research and development budget, and cooperation between academia, research centres and private institutions are among the main challenges facing the pharmaceutical production sector in Saudi Arabia.

4.6.2 Pharmaceutical services needs

Consistent with other studies, current perceptions about pharmacists' role in Saudi Arabia were predominantly centred on medication dispensing (Almeman and Aljedai, 2016; Almansour et al., 2020a; Albabtain et al., 2021). The lack of detailed

medication counselling on medication dispensing was the key reason for the dissatisfaction of both professional and public participants. A possible explanation for the dominance of medication dispensing over other roles could be the high prevalence of non-Saudi pharmacists who come from medication dispensing practice only. Another explanation could be the limited clinical services and medication counselling areas to large hospitals and pharmacists with advanced clinical degrees might have made pharmacists in other hospitals and community pharmacies perceive that their role is limited to supplying medication only.

The current model of practice, where pharmacy care services are provided mainly in large hospitals only, was perceived as not satisfying the current reforms of the health system to optimise care services capacity nor the needs and demands of the population's accessible healthcare services. The need for patient-centred services in community pharmacies was reported by both professional and public participants as a pharmaceutical service need. Consistent with other studies, the limited capacity of hospitals and PHCCs as well as the accessibility and flexibility of community pharmacies opening hours drove both professional and public participants to prefer community pharmacies over PHCCs and hospitals for common health-related problems, especially minor illnesses and medication-related enquiries (Almansour et al., 2020a; Rasheed et al., 2020). The growing population and NCDs require the health system to expand its capacity beyond the traditional venues of PHCCs and hospitals to address the increasing demand for health services. The position of community pharmacists as the most accessible healthcare professional in primary healthcare settings qualify them to contribute effectively to the early detection and prevention of diseases as well as the management of NCDs (FIP, 2006). Several studies reported the benefits of extending the role of pharmacists as care providers in community pharmacies has improved patients' quality of life, optimised drug therapy and reduced long-term healthcare costs. These benefits prompted developed countries to utilise pharmacists' capabilities in the provision of patient-centred services in community pharmacies such as the early detection and screening of diseases, the management and monitoring of diseases and public health interventions (Dunlop and Shaw, 2002; Giberson, 2013; Smith et

al., 2011). Within the Saudi context, offering specialised services in community pharmacies such as management and monitoring of NCDs, anticoagulation clinics, health promotion and disease prevention and treatment of minor illnesses were believed to extend the capacity of the health system and support healthcare provision, ultimately bringing significant economic and health outcomes returns on the health system in Saudi Arabia. A study conducted by Alomi et al (2019) estimated the potential financial implication of specialised pharmaceutical care services in a large hospital in Riyadh city where it led to the avoidance of drug-related problems, including hospital admissions and emergency department visits, with an average cost of 13 million US dollars per month. This suggests that extending the capacity of pharmacists to provide such specialised services in an outreach and accessible setting, i.e., community pharmacy, not only could prevent medication-related problems on a wider level effectively but could also significantly reduce healthcare costs. Further studies to evaluate the economic impact of such services in community pharmacies are required.

While the recent MOH regulations allowed the provision of these services in community pharmacies, the specific roles, standard operating procedures, and scope of practice need to be clearly defined for the effective and wide implementation of services. Other studies highlighted the need for governmental financial support to fund operation costs, pharmacists' remuneration and patients' non-payment for these services to enable implementation and ensure sustainability and effective uptake by the public of these services in community pharmacies (Almansour et al., 2020a; Almansour et al., 2020b; Rasheed et al., 2020). Consistent with this, promoting the potential of pharmacists as care providers by regulatory bodies and professional organisations is required at the external level with other healthcare professionals, regulators and the public to change current perceptions of pharmacists' roles, enabling the expansion and enhancing acceptance and utilisation of new services. At the internal level, the profession must consider developing educational curricula, experiential training, CPD and CE activities and professional developmental frameworks for adopting new roles, especially since most community pharmacists are non-Saudi and come from countries where clinical education and training is almost lacking. The varying level of competencies in community pharmacists require initial education and professional development activities to bridge the gap and develop competencies required to expand pharmacists' roles, enable the transition of practice. Collaboration between pharmacy leadership and pharmacy sectors is also critical to analyse the current labour market demands of every pharmacy sector and planning the required supply from initial education and direction of CPD and CE activities. Governmental support is indeed required to foster role shifting within the health system and allow the utilisation of pharmacists as the primary care workforce to spare hospital capacity for complex and specialised care services. Finally, the design and implementation of pharmacy based services in the Saudi context should consider the populations' particular health beliefs and health seeking behaviours as they drive the eventual engagement with these novel services and maximise its benefits and future sustainability.

4.6.3 Approaches to needs-based education

In line with other studies, this study highlighted the tendency of graduates to practise in hospitals compared to other pharmacy practice settings (Almaghaslah et al., 2018; AlRuthia et al., 2018a). Local pharmacy education appeared to have contributed to a large extent in limiting the capacity of graduates to merely hospital practice thereby unpreparedness to practise in other fields, such as community pharmacies and the pharmaceutical industry, which represent the largest sectors of pharmacy practice in the country.

The participants from community pharmacies reported the lack of effective communication skills in graduates as the main reason for community pharmacy owners preferring to employ non-Saudi pharmacists. The professional experience that all non-Saudi pharmacists have, particularly those from Eastern Mediterranean countries as they must practise locally in their home countries for at least two years before they are allowed to travel for work in Saudi Arabia, was the key reported reason for this preference. Indeed, the lack of effective communication skills in graduates was reported by the public participants to contribute to the hesitancy of

consumers to trust community pharmacists' advice because they do not communicate and interact with them effectively during medication dispensing. The current educational curricula lack dedicated communication skills courses and core experiential training in community pharmacies, and if they exist, only comprise one or two courses throughout the programme (Alaqeel and Abanmy, 2015; Alhamoudi and Alnattah, 2018; Balkhi et al., 2020). Almetwazi et al (2020) assessed students' satisfaction regarding their short experiential training in community pharmacy and found that some students did not get the opportunity to talk or interact with patients during the training period, nor was it sufficient to allow students the required interaction with patients to improve their verbal and non-verbal communication skills.

This study also highlighted the lack of Saudi pharmacists in the pharmaceutical industry. Consistent with Saleh et al (2015) and Alhomoud et al (2019), the present study suggested that the recent transformation to PharmD curricula might have limited students' required knowledge and skills to practise in the pharmaceutical industry. The participants from the pharmaceutical industry in this study highlighted that the lack of basic sciences and lab-based pharmaceutical sciences courses in the PharmD curricula contributed to students lack of required knowledge and skills to work in the pharmaceutical industry. Besides academic courses, the lack of experiential training in the pharmaceutical industry appeared to be vital to students' preference for future employment. A study by Saleh et al (2015) reported that 83% of surveyed students had not received practical learning in pharmaceutical industries compared to hospitals, which therefore influenced their choice of future career path. However, the need to secure a sustainable source to essential medications through the localisation of the pharmaceutical industry underpins the need for a qualified local workforce to localise this industry in Saudi Arabia.

The shortage of local pharmacists has prompted the government to increase the number of pharmacy schools in the last two decades (Alhamoudi and Alnattah, 2018; Almaghaslah et al., 2018). However, the rapid growth of schools within a relatively short period might have affected the quality of graduates. It has been

challenging for the new schools to recruit an adequate quantity and quality of academic faculty and teaching practitioners with the required clinical background to teach a heavily weighted clinical curriculum. Consistent with the literature, the limited availability of training sites with well-rounded clinical preceptors and advanced practice sites for appropriate experiential training for students has limited the acquisition of effective clinical skills by the graduates (Almeman and Al-jedai, 2016; Al-jedai et al., 2016; Badreldin et al., 2020).

It is understood that the intention of adopting PharmD as an entry-degree to practice by most pharmacy schools was to qualify graduates with the required clinical-based knowledge and skills to provide clinically oriented pharmaceutical services (Kheir et al., 2008; Al-jedai et al., 2016; Aljadhey et al., 2017; Almalki et al., 2011). However, a lack of a job description and clear roles for PharmD and BPharm qualifications in practice was perceived by the study participants to force PharmD graduates to perform the same jobs as BPharm graduates despite the difference in knowledge and skills. This suggests that the transformation to the PharmD programme might be inconsistent as there is a mismatch between what students are taught in school, what they implement in practice and pharmacy practice needs. Further studies are required to investigate this issue.

This study suggests that local pharmacy education presents a barrier to workforce preparedness to practise in areas of high need and opportunities, namely, community pharmacies and industrial pharmacy. The mismatch between initial education and real practice expectations as well as outdated curricula, limited scope experiential training have hindered the students' abilities to explore other career paths where there is an increased demand and opportunities for pharmacists. Limiting experiential training to hospitals only in the last decades with no or limited experiences in other areas may have limited graduates' job opportunities and professional growth beyond hospital pharmacy practice. The insufficiency of the existing measures and frameworks to assure the quality of educational programme outcomes might have also contributed to limiting education development and students' achievement of required competencies.

The current transformation of the country's health system and the shift in the population disease profile as well as societal needs and expectations of pharmacists must serve as stimuli for innovation, rethinking and revaluation of how current pharmacy education in Saudi Arabia could educate and prepare students for a growing era of practice. Transforming the model of local education to be needsbased provides pharmacy schools with the framework to assess the development of care providers' competencies in graduates and allow those with non-clinical career goals to explore other interests within the labour market. To guarantee practice readiness, pharmacy education should feature emerging practice areas, highlight developed pharmacy practice models and promote practice transformation to the increased demands and opportunities for pharmacists (Kanmaz et al., 2022). The breadth of career opportunities available to pharmacists requires pharmacy schools to prepare students to use competencies earned from their education in many different roles (Lebovitz and Rudolph, 2020). Therefore, the transformation of the current educational model and educational curricula in Saudi pharmacy education is required to reflect the current changes in the practice environment and drive the transformation to wide-ranging fields of highly qualified pharmacists in both direct and non-direct care roles to meet the country's needs of pharmacists. While the supply of traditional pharmacists is required to transform the practice and fulfil patient-oriented services needed in community pharmacies, this study also highlighted the need for pharmacy education to train and encourage students to explore non-patient-facing roles, particularly in pharmaceutical industry. To ensure their graduates secure full-time employment, pharmacy schools are also encouraged to extend experiential training opportunities to other growing fields such as health insurance and health informatics. Experiential training is the perfect opportunity for students to experience non-traditional areas of practice as potential career paths (Kanmaz et al., 2022). This will support non-traditional career interests, and enhance graduate opportunities for innovation, advocacy and development without sacrificing developing professional fundamental patient care skills for all future pharmacy professionals (Kanmaz et al., 2022).

4.6.4 Implications

This study provided insights into how pharmacy services and pharmacists' roles could extend the capacity and responsiveness of the health system. This can inform regulators and policymakers' decisions in developing local pharmacy services to enhance health system responsiveness. Knowing the status of pharmacy education and the readiness of graduates to join the labour market can inform future initiatives to improve the process and outcomes of the local pharmacy educational system to be needs-based education. The findings highlighted the lack of awareness of future pharmacists about available opportunities and roles within the profession due to the hospital-focused curricula, therefore, promotion of these roles within the dedicated curricula and/or experiential training is required. Saudisation of the pharmacy workforce is important to ensure continuity of employment, hence, continuity of health service provision. However, the focus should not be directed to increasing the number of pharmacy graduates, but also on improving the quality and competencies of graduates to perform effectively based on labour market needs. Therefore, the collaboration between practice and education is required for effective workforce planning through the identification of health system demands to inform planning for workforce supply. Establishing the required foundations and frameworks to expand pharmacists' roles in Saudi Arabia requires evidence-based approaches to guide academia and fulfil pharmacy practice needs. Therefore, establishing a unified national competency framework will help to guide pharmacy education development. It will inform the development of competency-based education required for graduates to maximise their capacity to the desired level of competence to meet the country's healthcare needs. It will also establish and maintain core quality elements to enrich the pharmacy education process, curriculum development, and the learning outcomes of undergraduate students as well as current pharmacists' professional development. This will ultimately impact the profession and optimise benefits for overall national health.

4.6.5 Limitations

Due to the exploratory nature of this study, a qualitative approach was used to identify unmet healthcare needs. Nevertheless, optimal healthcare needs

assessment requires cost-effectiveness and epidemiological approaches in addition to the qualitative approach to provide a comprehensive picture of the population's healthcare needs in a certain context (Stevens and Gillam, 1998). The sample of participants in this study does not represent the total pharmacy population or the general population. The findings, therefore, are not inclusive or generalisable but insights might be transferable to improve pharmacy education and practice in Saudi Arabia. Since the sampling of professional participants was purposive and the public was convenient, it might not have captured the full spectrum of views of policymakers, pharmacists and the public. Recruitment of public participants from five cities (Riyadh, Makkah, Dammam, Jazan and Tabuk) may have limited applicability of the study findings to other cities. However, a maximum variation sampling strategy was adopted to ensure representation of all genders with different backgrounds and age groups. Although a rigorous inductive thematic analysis process was undertaken, the clinical intent of the enquiry as well as the pragmatic lens in creating a thematic structure of the findings may have led to apparent overlap in some of the identified themes and interview topics. Lastly, I followed a reflexive approach throughout the data analysis and interpretation by ignoring any personal experiences and keeping a reflexive diary, however, unavoidable personal assumptions may still exist during data categorisation and interpretation.

4.7 Conclusion

This study identified the healthcare needs that can benefit from pharmacists' care in Saudi Arabia. Current healthcare needs suggest the need for pharmacists in care provision roles in community pharmacies to optimise health system capacity by increasing access to primary care services and medication advice, thereby minimising the strain on the health system and improving health outcomes. The current transformation of the country's health system suggests the need for diversification of pharmacists' roles in both direct and non-direct care to address the country's needs of pharmacists and stimulate the growth of the profession beyond hospital-centred pharmacy practice. A mismatch between initial education and real practice expectations was highlighted in this study. Enhancing the quality

of initial education and professional development activities to equip pre and inservice pharmacists with needs-based competencies is required to meet societal healthcare needs, thereby improving the overall national health.

Chapter 5: Competencies identification- determining competencies required for effective professional performance

5.1 Introduction

This chapter describes phase 2 of this research - two consecutive studies to identify core competencies required for effective professional performance in the local context, with the aim of forming the basis of a national competency framework for foundation-level pharmacists in Saudi Arabia. This chapter presents the overall aim and objectives of this phase, followed by the separate study details including the methods, data collection and data analysis as well as the findings and implications for practice.

Disclaimer:

This chapter is an expanded version of two published research articles:

- Phase 2a: ALFAIFI, S., ARAKAWA, N. & BRIDGES, S. 2022. The relevance of the International Pharmaceutical Federation Global Competency Framework in developing a country-level competency framework for pharmacists: A cross-sectional study. Exploratory Research in Clinical and Social Pharmacy, 5, p.100095.
- Phase 2b: ALFAIFI, S., BRIDGES, S. & ARAKAWA, N. 2022. Developing pharmacists' competencies in Saudi Arabia: A proposed national competency framework to support initial education and professional development. Currents in Pharmacy Teaching and Learning, 14, 1256-1268

5.2 Aim

To identify and describe competencies considered essential for the effective performance of foundation level pharmacists within all sectors of practice in Saudi Arabia.

5.3 Objectives

5.3.1 To assess pharmacists' perception of the relevance of the FIP GbCF v1 to their own practice.

5.3.2 To develop a profession-wide competency framework for foundation level pharmacists in Saudi Arabia using the FIP GbCF v2 as the source framework.

5.4 Methods

Two consecutive studies comprising a survey and NGT were used to achieve the aim of this phase. A national survey was used in phase 2a to address the first objective. This helped to identify the competencies required for effective professional performance and obtain greater consultation on the relevance of the FIP GbCF v1 to the practice of pharmacists within all sectors on a national level. Phase 2b used an NGT to address the second objective. This helped to develop a national competency framework for foundation-level pharmacists in Saudi Arabia. The details of each study are described in the following sections.

5.5 Phase 2a: The relevance of the FIP GbCF to the Saudi pharmacy practice environment

5.5.1 Study design

A cross-sectional anonymous online survey was utilised in this study to assess the relevance of the FIP GbCF v1 to the practice of a broad population of pharmacists across different settings of practice in Saudi Arabia.

5.5.2 Survey development

Rather than developing a competency framework from scratch, as described in Chapter 3 (section 3.3.1) the FIP GbCF was applied as a mapping tool to inform the development of a national competency framework.

At the time of the survey development, the second updated version of the FIP GbCF v2 had not been published (International Pharmaceutical Federation, 2020b), therefore, the survey was fully adopted from the FIP GbCF v1 (International Pharmaceutical Federation, 2012c). The online survey was designed and distributed using the JISC Online Surveys platform (JISC Online Surveys, Bristol, United Kingdom). The presentation of the statements followed the FIP GbCF v1 structure: 100 behavioural statements under 20 competency groups and divided over four broad clusters: Pharmaceutical public health (PPH), Pharmaceutical care (PC), Organisation and management (OM) and Professional/Personal (PP) (International Pharmaceutical Federation, 2012c).

The online survey comprised seven pages with 113 questions: a cover page providing the background and the purpose of the study, an electronic informed consent form and nine demographic questions followed by questions about the behavioural statements of the GbCF v1. The respondents were asked to rate the relevance of each statement to their current practice using a four-point Likert scale: highly relevant, relevant, low relevance and not relevant. The choice of a four-point Likert scale was to obtain a specific response about the relevance of each behavioural statement to their practice without being neutral. Open-ended

questions were added at the end of each cluster whereby the participants were asked to add any comments or additional behaviours that they consider useful or relevant for each cluster (see Appendix 6 for a copy of the survey). All survey items were designed in English, the commonly used language of health professions in Saudi Arabia.

The survey was designed to be submitted only if the respondents had replied to all questions within each cluster to prevent missing values within the survey responses. If a respondent did not answer a question, they were alerted when clicking the submission button by stating which question(s) were missed.

5.5.3 Sampling and data collection

As described in Chapter 3 (section 3.4.2.2), all registered pharmacists were eligible for inclusion in this study. Therefore, a purposive sampling approach was used by approaching the SCFHS and the SPS to assist in the survey distribution. They were asked to send the survey anonymous URL link to the emails of all pharmacists included in their registry lists.

Sample size calculations were conducted using the Raosoft® online sample calculator (Raosoft Inc, Seattle, Washington, USA) based on the number of pharmacists stated in the MOH statistical book for 2019 (Ministry of Health, 2020). Using a total number of 31,872 pharmacists, 5% accepted error of margin, 95% confidence interval and 50% response distribution within the target sample, the minimum required sample size was 380 participants.

The online survey was opened on 20th August 2020 and sent via the SCFHS and SPS to more than 30,000 pharmacists included in their registry lists. The email involved the study title, the name of the researchers, and a message to encourage the recipients to participate. It also informed them that their participation in the survey is voluntary and their responses will be anonymous and confidential. Participants also were informed about their right to withdraw their data at any time unless the data has been analysed and published at the time of withdrawal request. No

incentives were provided for the participants and no personal identifiable information was collected.

In the first time of sending the survey, 158 responses were received. Therefore, a snowballing sampling approach was utilised to increase participation. The survey URL link was further modified and distributed to my professional contact list via the social media platform, WhatsApp®. Contacts were asked to assist by forwarding the survey URL link to their contacts and colleagues.

The data collection was conducted between August and November 2020. The SCFHS sent the first email on 20th August, followed by reminders every two weeks for three months. The SPS sent one email to their members on 4th October 2020. The survey was closed on 20th November 2020. Due to "snowballing effect" created from using snowballing approach in the data collection process, the final response rate was not calculated after closing the survey due to inappropriateness to report such measure with such sampling approach.

5.5.4 Data analysis

Quantitative data were downloaded directly into Microsoft Excel spreadsheets. All data were cleaned and coded manually and systematically checked for errors. Of this, 10% data were cross-checked with the original downloaded Excel spreadsheet. Due to the survey design and programming, there were no missing values within the responses of behavioural statements in all clusters. However, there were some minimal missing values within some of the demographics questions, namely initial education and experiences in other areas of practice, where they were not programmed as mandatory to be answered. Therefore, missing values were replaced with code-99 to ensure the accuracy of data analysis. Then, the data were exported to the Statistical Package for Social Sciences (SPSS) version 27, for quantitative data analysis using descriptive and inferential statistics.

Demographic data were analysed and reported using percentages and frequencies.

To ensure a meaningful interpretation of the four-point Likert scale relevance

rating, and for the purpose of analysis, it was planned a priori to integrate the response categories of "highly relevant" and "relevant" into one category: relevant; and the response categories of "low relevance" and "not relevant" into one category: not relevant. The agreement on relevance to practice was compared between these categories using percentages and frequencies. The percentages of relevance ratings within each cluster in relation to the respondents' characteristics were represented graphically using heat maps. The cut-off point on relevance to practice was attained when equal to or more than 80% of the responses were in the "relevant" category. The published literature informed the decision to define at least 80% as the cut-off point on relevance rating (Mucalo et al., 2016; Al-Haqan et al., 2021; Udoh et al., 2018; Arakawa et al., 2020b). Behavioural statements that had high responses in the "not relevant" category were further analysed using Pearson's Chi-square (χ^2) test to evaluate the association between the responses and respondents' characteristics. This included the area of practice (community pharmacy, hospital, PHCCs, academia, industry, regulatory organisations and others); length of time in practice (≤1 years, 2-3 years, 4-5 years, 6-10 years, 11-20 years, 21-30 years and >30 years), years qualified (0-5 years, 6-10 years, 11-20 years, 21-30 years and >30 years) and initial education (BPharm or PharmD) as well as other demographics such as nationality (Saudi or non-Saudi) and gender (male or female). To identify the significance in the analysis, a probability level of P<0.05 was used.

Qualitative data from open-ended questions were downloaded directly into a Microsoft Word document then analysed thematically using Qualitative Analysis Software NVivo version 12.

5.5.5 Results

5.5.5.1 Demographics

A total of 544 responses were received, of which, 22 were excluded because they did not meet the inclusion criteria, i.e., a registered pharmacist. This included 18 pharmacy technicians, 2 retired, 1 unemployed, and 1 student. Thereafter, the remaining 522 responses were considered valid and used in the analysis. Of the 552 responses, 418 (80.1%) were male, 342 (65.5%) non-Saudi, 357 (68.4%) BPharm holders and 224 (42.9%) were from Riyadh. Respondents working in DPC settings, including community pharmacy, hospital pharmacy and PHCCs, accounted for 79.3% of the sample. Respondents' median length of practice was ten years (IQR ±10). Respondents' characteristics are shown in Table 5.1

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Table 5.1: Demographic characteristics of the respondents (n=522)

Median Age (IQR)		37 years (±11)
Gender	Male	418 (80.1%)
	Female	104 (19.9%)
Nationality	Saudi	180 (34.5%)
, reaction and y	Non-Saudi	342 (65.5%)
Province	Riyadh	224 (42.9%)
110411100	Makkah	119 (22.8%)
	Eastern province	73 (14%)
	Madinah	19 (3.6%)
	Qassim	13 (2.5%)
	Asir	20 (3.8%)
	Najran	7 (1.3%)
	Bahah	3 (0.6%)
	Hai'l	11 (2.1%)
	Tabuk	6 (1.1%)
	Jawf	5 (1%)
	Northern borders	7 (1.3%)
	Jizan	15 (2.9%)
Initial degree of adjustion	BPharm	357 (68.4%)
Initial degree of education	=	
Hald con a catava duata a duatica	PharmD	69 (13.2%)
Hold any postgraduate education	Yes	124 (23.7%)
Median years qualified (IQR)		11 years
V 1161 1		(IQR±13)
Years qualified	0 to 5 years	137 (26.2)
	6 to 10 years	106 (20.3)
	11 to 20 years	207 (39.7)
	21 to 30 years	56 (10.7)
	>30 years	16 (3.1)
Patient-facing setting	DPC	414 (79.3)
	NDPC	108 (20.7)
Median years in current area of practice (IQR)		10 (IQR±10)
Years in current area of practice	≤1 years	38 (7.3)
	2 to 3 years	57 (10.9)
	4 to 5 years	71 (13.6)
	6 to 10 years	122 (23.4)
	11 to 20 years	190 (36.4)
	21 to 30 years	35 (6.7)
	>30 years	9 (1.7)
Practice setting	Community pharmacy	220 (42.1%)
	Hospital	166 (31.8%)
	Primary healthcare centre	28 (5.4%)
	Academia	27 (5.2%)
	Industry	52 (10%)
	Regulatory organizations	20 (3.8%)
	Other	9 (1.7%)
Previous work experience in other	Yes	493 (94.4%)
practice area		, , , ,
	1	

Abbreviations for respondents characteristics: Interquartile rang (IQR), Bachelor's degree in pharmacy (BPharm), Doctor of pharmacy (PharmD), Direct Patient Care (DPC), Non-Direct Patient Care (NDPC).

5.5.5.2 Relevance rating- overall

From the 100 behavioural statements rated within the four competency clusters, 84 met the cut-off point of at least 80% agreement over relevance. The aggregated responses of each cluster shows that the PPH cluster scored the highest percentage of relevant responses (91.42%), followed by the PP cluster (87.08%), while a higher percentage of not relevant responses were evident in the OM cluster and PC cluster (18.40% and 14.66% respectively) (Figure 5.1). The ratings of the behaviours ranged from 95% (the highest rating) for behaviour 15.1"communicate clearly, precisely and appropriately while being a mentor or tutor" within the communication skills competency group in the PP cluster to 73.8% (the lowest rating) for behaviour 9.5 "ensure proper reference sources for service reimbursement" within the budget and reimbursement competency group in the OM cluster. The following section describes the relevance rating of each cluster in detail.

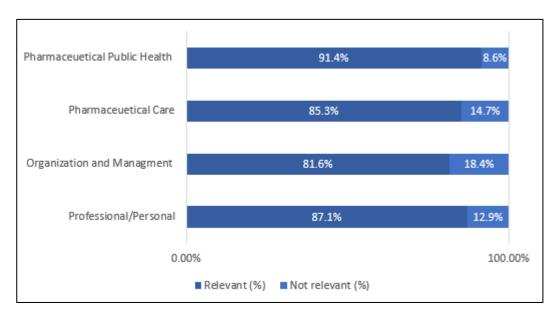


Figure 5.1: Overall relevance rating between the FIP GbCF v1 clusters

5.5.5.3 Relevance rating- per competency cluster

5.5.5.3.1 PPH cluster

Table 5.2 shows the count and percentage of the aggregated response's relevance rating for each behavioural statement under the PPH cluster competency groups to the Saudi pharmacy practice environment. It shows an average of 8.57% of the responses ranked the behavioural statements in this cluster as "not relevant" to practice. None of the behavioural statements responses have a percentage above the predefined cut-off point of relevance (20%). Hence, all four behaviours within the cluster were nationally agreed upon as relevant to practice.

Table 5.2: Respondents relevance ratings of behavioural statements in PPH cluster

Pharmaceutical Public Health (PPH) cluster				
Competency	Behavioural statements	Total	Relevant	Not
group				relevant
			Count (%)	Count (%)
1. Health	1.1. Assess the primary healthcare needs	522	477	45 (8.6%)
promotion	(taking into account the cultural and social		(91.4%)	
	setting of the patient)			
	1.2. Advise on health promotion, disease	522	478	44 (8.4%)
	prevention and control, and healthy		(91.6%)	
	lifestyle			
2. Medicines	2.1. Counsel population on the safe and	522	485	37 (7.1%)
information	rational use of medicines and devices		(92.9%)	
and advice	(including the selection, use,			
	contraindications, storage, and side effects			
	of non-prescription and prescription			
	medicines)			
	2.2. Identify sources, retrieve, evaluate,	522	469	53 (10.2%)
	organise, assess and disseminate relevant		(89.8%)	
	medicines information according to the			
	needs of patients and clients and provide			
	appropriate information			
PPH cluster ave	rage	2088	1909 (91.42%	179 (8.57%)

5.5.5.3.2 PC cluster

Most respondents (93.7%) perceived behavioural statement number (6.3) "ensure appropriate medicines, route, time, dose, documentation, action, form and response for individual patients" as most relevant to their practice (

Table 5.3). However, behavioural statement number (4.1) "prepare pharmaceutical medicines (e.g. extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)" was perceived as the least relevant with 26.1% of respondents ranking it as 'not relevant' to their practice.

Table 5.3: Respondents relevance ratings of behavioural statements in PC cluster

Pharmaceutical (Care (PC) cluster			
Competency	Behavioural statements	Total	Relevant	Not
group				relevant
			Count (%)	Count (%)
3. Assessment	3.1. Appropriately select medicines (e.g.	522	470 (90%)	52 (10%)
of medicines	according to the patient, hospital,			
	government policy, etc.)			
	3.2. Identify, prioritise and act upon	522	484	38 (7.3%)
	medicine-medicine interactions; medicine-		(92.7%)	
	disease interactions; medicine-patient			
	interactions; medicines-food interactions			
4.Compounding	4.1. Prepare pharmaceutical medicines	522	386	136
medicines	(e.g. extemporaneous, cytotoxic		(73.9%)	(26.1%)
	medicines), determine the requirements			
	for preparation (calculations, appropriate			
	formulation, procedures, raw materials,			
	equipment etc.)			
	4.2. Compound under the good	522	401	121
	manufacturing practice for pharmaceutical		(76.8%)	(23.2%)
	(GMP) medicines			
Dispensing	5.1. Accurately dispense medicines for	522	473	49 (9.4%)
	prescribed and/or minor ailments and		(90.6%)	
	monitor the dispense (re-checking the			
	medicines)			
	5.2. Accurately report defective or	522	451	71 (13.6%)
	substandard medicines to the appropriate		(86.4%)	
	authorities.			
	5.3. Appropriately validate prescriptions,	522	471	51 (9.8%)
	ensuring that prescriptions are correctly		(90.2%)	
	interpreted and legal			
	5.4. Dispense devices (e.g. inhaler or a	522	431	91 (17.4%)
	blood glucose meter)		(82.6%)	
	5.5. Document and act upon dispensing	522	445	77 (14.8%)
	errors		(85.2%)	

Pharmaceutical (Care (PC) cluster			
Competency group	Behavioural statements	Total	Relevant	Not relevant
group			Count (%)	Count (%)
	5.6. Implement and maintain a dispensing	522	430	92 (17.6%)
	error reporting system and a 'near misses'		(82.4%)	, ,
	reporting system		`	
	5.7. Label the medicines (with the required	522	459	63 (12.1%)
	and appropriate information)		(87.9%)	
	5.8. Learn from and act upon previous	522	447	75 (14.4%)
	'near misses' and 'dispensing errors'		(85.6%)	
6. Medicines	6.1. Advise patients on proper storage	522	477	45 (8.6%)
	conditions of the medicines and ensure		(91.4%)	
	that medicines are stored appropriately			
	(e.g. humidity, temperature, expiry date, etc.)			
	6.2. Appropriately select medicine	522	471	51 (9.8%)
	formulation and concentration for minor		(90.2%)	
	ailments (e.g. diarrhoea, constipation,		`	
	cough, hay fever, insect bites, etc.)			
	6.3. Ensure appropriate medicines, route,	522	489	33 (6.3%)
	time, dose, documentation, action, form		(93.7%)	
	and response for individual patients			
	6.4. Package medicines to optimise safety	522	451	71 (13.6%)
	(ensuring appropriate re-packaging and		(86.4%)	
	labelling of the medicines)			
7. Monitor	7.1. Apply guidelines, medicines formulary	522	460	62 (11.9%)
medicines	system, protocols and treatment pathways		(88.1%)	
therapy	7.2. Ensure therapeutic medicines	522	448	74 (14.2%)
	monitoring, impact and outcomes		(85.8%)	
	(including objective and subjective			
	measures)		455	67 (40 00()
	7.3. Identify, prioritise and resolve	522	455	67 (12.8%)
	medicines management problems		(87.2%)	
Q Dationt	(including errors)	F22	398	124
8. Patient consultation	8.1. Apply first aid and act upon arranging follow-up care	522	(76.2%)	(23.8%)
and diagnosis	8.2. Appropriately refer	522	424	98 (18.8%)
and diagnosis	8.2. Appropriately refer	322	(81.2%)	98 (18.870)
	8.3. Assess and diagnose based on	522	415	107
	objective and subjective measures	322	(79.5%)	(20.5%)
	8.4. Discuss and agree with the patients	522	444	78 (14.9%)
	the appropriate use of medicines, taking		(85.1%)	
	into account patients' preferences		(== .,=)	
	8.5. Document any intervention (e.g.	522	431	91 (17.4%)
	document allergies, medicines and food, in		(82.6%)	` ′
	patient medicines history)			
	8.6. Obtain, reconcile, review, maintain	522	426	96 (18.4%)
	and update relevant patient medication		(81.6%)	
	and diseases history			
PC cluster averag	ge	13050	11137	1913
			(85.34%)	(14.66%)

5.5.5.3.3 OM cluster

Most respondents (88.5%) perceived behavioural statement number (11.2) "resolve, follow up and prevent medicines related problems" as most relevant to their practice (

Table 5.4). However, behavioural statement number (9.5) "ensure proper reference sources for service reimbursement" was perceived as the least relevant with 26.2% of respondents ranking it as 'not relevant' to their practice.

Table 5.4: Respondents relevance ratings of behavioural statements in OM cluster

Competency group	Behavioural statements	Total	Relevant	Not relevant
			Count (%)	Count (%)
9. Budget and reimbursement	9.1. Acknowledge the organisational structure	522	432 (82.8%)	90 (17.2%)
	9.2. Effectively set and apply budgets	522	404 (77.4%)	118 (22.6%)
	9.3. Ensure appropriate claim for the reimbursement	522	386 (73.9%)	136 (26.1%)
	9.4. Ensure financial transparency	522	391 (74.9%)	131 (25.1%)
	9.5. Ensure proper reference sources for service reimbursement	522	385 (73.8%)	137 (26.2%)
10. Human resources management	10.1. Demonstrate organisational and management skills (e.g. know, understand and lead on medicines management, risk management, self-management, time management, people management, project management, policy management)	522	429 (82.2%)	93 (17.8%)
	10.2. Identify and manage human resources and staffing issues	522	397 (76.1%)	125 (23.9%)
	10.3. Participate, collaborate, advise in therapeutic decision-making and use appropriate referral in a multi-disciplinary team	522	433 (83%)	89 (17%)
	10.4. Recognise and manage the potential of each member of the staff and utilise systems for performance management (e.g. carry out staff appraisals)	522	415 (79.5%)	107 (20.5%)
	10.5. Recognise the value of the pharmacy team and of a multidisciplinary team	522	449 (86%)	73 (14%)
	10.6. Support and facilitate staff training and continuing professional development	522	458 (87.7%)	64 (12.3%)
11. Improvement	11.1. Identify and implement new services (according to local needs)	522	447 (85.6%)	75 (14.4%)
of service	11.2. Resolve, follow up and prevent medicines related problems	522	462 (88.5%)	60 (11.5%

Organisation an	d Management (OM) cluster			
Competency group	Behavioural statements	Total	Relevant	Not relevant
			Count (%)	Count (%)
12.	12.1. Access reliable information and	522	436	86 (16.5%)
Procurement	ensure the most cost-effective medicines in		(83.5%)	
	the right quantities with the appropriate			
	quality			
	12.2. Develop and implement contingency	522	434	88 (16.9%)
	plan for shortages		(83.1%)	
	12.3. Efficiently link procurement to	522	416	106
	formulary, to push/pull system (supply		(79.7%)	(20.3%)
	chain management) and payment			
	mechanisms			
	12.4. Ensure there is no conflict of interest	522	413	109
			(79.1%)	(20.9%)
	12.5. Select reliable supplies of high-quality	522	422	100
	products (including appropriate selection		(80.8%)	(19.2%)
	process, cost effectiveness, timely delivery)			
	12.6. Supervise procurement activities	522	408	114
			(78.2%)	(21.8%)
	12.7. Understand the tendering methods	522	402 (77%)	120 (23%)
	and evaluation of tender bids			
13. Supply	13.1. Demonstrate knowledge in store	522	439	83 (15.9%)
chain and	medicines to minimise errors and maximise		(84.1%)	
management	accuracy			
	13.2. Ensure accurate verification of rolling	522	426	96 (18.4%)
	stocks		(81.6%)	
	13.3. Ensure effective stock management	522	430	92 (17.6%)
	and running of service with the dispensary		(82.4%)	
	13.4. Ensure logistics of delivery and	522	418	104
	storage		(80.1%)	(19.9%)
	13.5. Implement a system for	522	420	102
	documentation and record keeping		(80.5%)	(19.5%)
	13.6. Take responsibility for quantification	522	420	102
	of forecasting		(80.5%)	(19.5%)
14. Workplace	14.1. Address and manage day to day	522	453	69 (13.2%)
management	management issues		(86.8%)	/ />
	14.2. Demonstrate the ability to take	522	456	66 (12.6%)
	accurate and timely decisions and make		(87.4%)	
	appropriate judgements		(22 (1=21)
	14.3. Ensure the production schedules are	522	433 (83%)	89 (17%)
	appropriately planned and managed			22 (12 22()
	14.4. Ensure the work time is appropriately	522	453	69 (13.2%)
	planned and managed	522	(86.8%)	76 (4.1.600)
	14.5. Improve and manage the provision of	522	446	76 (14.6%)
	pharmaceutical services	500	(85.4%)	101
	14.6. Recognise and manage pharmacy	522	418	104
ONA CL. :	resources (e.g. financial, infrastructure)	46701	(80.1%)	(19.9%)
OM Cluster aver	rage	16704	13631	3073
			(81.60%)	(18.40%)

5.5.5.3.4 PP cluster 4

Most respondents (95%) perceived behavioural statement number (15.1) "
Communicate clearly, precisely and appropriately while being a mentor or tutor" as most relevant to their practice (

Table 5.5). However, behavioural statement number (19.1) "Apply research findings and understand the benefit risk (e.g. pre-clinical, clinical trials, experimental clinical-pharmacological research and risk management)" was perceived the least relevant with 20.5% of respondents ranking it as 'not relevant' to their practice.

Table 5.5: Respondents relevance ratings of behavioural statements in OM cluster

Professional/ Pe	rsonal (PP) cluster			
Competency group	Behavioural statements	Total	Relevant	Not relevant
			Count (%)	Count (%)
15. Communication skills	15.1. Communicate clearly, precisely and appropriately while being a mentor or tutor	522	496 (95%)	26 (5%)
	15.2. Communicate effectively with health and social care staff, support staff, patients, carer, family relatives and clients/customers, using lay terms and checking understanding	522	489 (93.7%)	33 (6.3%)
	15.3. Demonstrate cultural awareness and sensitivity	522	475 (91%)	47 (9%)
	15.4. Tailor communications to patient needs	522	477 (91.4%)	45 (8.6%)
	15.5. Use appropriate communication skills to build, report and engage with patients, health and social care staff and voluntary services (e.g. verbal and non-verbal)	522	479 (91.8%)	43 (8.2%)
16. Continuing	16.1. Document CPD activities	522	454 (87%)	68 (13%)
Professional Development	16.2. Engage with students/interns/residents	522	442 (84.7%)	80 (15.3%)
(CPD)	16.3. Evaluate currency of knowledge and skills	522	459 (87.9%)	63 (12.1%)
	16.4. Evaluate learning	522	448 (85.8%)	74 (14.2%)
	16.5. Identify if expertise needed outside the scope of knowledge	522	443 (84.9%)	79 (15.1%)
	16.6. Identify learning needs	522	446 (85.4%)	76 (14.6%)
	16.7. Recognise own limitations and act upon them	522	455 (87.2%)	67 (12.8%)
	16.8. Reflect on performance	522	465 (89.1%)	57 (10.9%)

Professional/ Pe	rsonal (PP) cluster			
Competency group	Behavioural statements	Total	Relevant	Not relevant
.			Count (%)	Count (%)
17. Legal and	17.1. Apply and understand regulatory	522	461	61 (11.7%)
regulatory	affairs and the key aspects of		(88.3%)	
practice	pharmaceutical registration and legislation			
	17.2. Apply knowledge in relation to the	522	438	84 (16.1%)
	principals of business economics and		(83.9%)	
	intellectual property rights including the			
	basics of patent interpretation			
	17.3. Be aware of and identify the new	522	461	61 (11.7%)
	medicines coming to the market		(88.3%)	
	17.4. Comply with legislation for drugs with	522	456	66 (12.6%)
	the potential for abuse		(87.4%)	
	17.5. Demonstrate knowledge in marketing	522	434	88 (16.9%)
	and sales		(83.1%)	
	17.6. Engage with health and medicines	522	468	54 (10.3%)
	policies		(89.7%)	
	17.7. Understand the steps needed to bring	522	451	71 (13.6%)
	a medicinal product to the market		(86.4%)	
	including the safety, quality, efficacy and			
	pharmacoeconomic assessments of the			
	product			
18.	18.1. Demonstrate awareness of local	522	474	48 (9.2%)
Professional	/national codes of ethics		(90.8%)	
and ethical	18.2. Ensure confidentiality (with the	522	484	38 (7.3%)
practice	patient and other healthcare professionals)	=00	(92.7%)	70 (40 00()
	18.3. Obtain patient consent (it can be	522	450	72 (13.8%)
	implicit on occasion)	F22	(86.2%)	40 (0 40()
	18.4. Recognise own professional	522	473	49 (9.4%)
	limitations	E22	(90.6%)	53 (10.2%)
	18.5. Take responsibility for own action and for patient care	522	469	53 (10.2%)
10 Quality	•	522	(89.8%) 415	107
19. Quality assurance and	19.1. Apply research findings and understand the benefit risk (e.g. pre-	322	(79.5%)	107 (20.5%)
research in the	clinical, clinical trials, experimental clinical-		(79.570)	(20.570)
workplace	pharmacological research and risk			
Workplace	management)			
	19.2. Audit quality of service (ensure that	522	432	90 (17.2%)
	they meet local and national standards and		(82.8%)	33 (271273)
	specifications)		,	
	19.3. Develop and implement Standing	522	427	95 (18.2%)
	Operating Procedures (SOPs)		(81.8%)	, ,
	19.4. Ensure appropriate quality control	522	417	105
	tests are performed and managed		(79.9%)	(20.1%)
	appropriately			
	19.5. Ensure medicines are not counterfeit	522	436	86 (16.5%)
	and quality standards		(83.5%)	
	19.6. Identify and evaluate evidence-base	522	433 (83%)	89 (17%)
	to improve the use of medicines and			
	services			
	19.7. Identify, investigate, conduct,	522	421	101
	supervise and support research at		(80.7%)	(19.3%)
	workplace (enquiry-driven practice)			

Professional/ Pe	rsonal (PP) cluster			
Competency group	Behavioural statements	Total	Relevant	Not relevant
			Count (%)	Count (%)
	19.8. Implement, conduct and maintain a	522	437	85 (16.3%)
	reporting system of pharmacovigilance		(83.7%)	
	(e.g. report Adverse Drug Reactions)			
	9.9. Initiate and implement audit and	522	422	100
	research activities		(80.8%)	(19.2%)
20. Self-	20.1. Apply assertiveness skills (inspire	522	476	46 (8.8%)
management	confidence)		(91.2%)	
	20.2. Demonstrate leadership and practice	522	476	46 (8.8%)
	management skills, initiative and efficiency		(91.2%)	
	20.3. Document risk management (e.g.	522	453	69 (13.2%)
	critical incidents)		(86.8%)	
	20.4. Ensure punctuality	522	467	55 (10.5%)
			(89.5%)	
	20.5. Prioritise work and implement	522	470 (90%)	52 (10%)
	innovative ideas			
PP cluster avera	ge	20358	17729	2629
			(87.1%)	(12.9%)

5.5.5.4 Relevance ratings- per respondents' characteristics

Further analysis of the "relevance" category was undertaken to obtain a better understanding of the respondents' characteristics that made them perceive behavioural statements as relevant to their practice. Therefore, the responses were aggregated using the multiple responses function in SPSS and percentages of "relevant" responses were compared between GbCF clusters for each of the following characteristics: patient-facing role, area of practice, length in practice, initial degree of education as well as other demographics such as nationality and gender.

5.5.5.4.1 Area of practice

Respondents from DPC settings showed a higher relevance across all clusters compared to NDPC settings (Figure 5.2). Respondents from NDPC settings showed higher relevance in PPH (85.10%) and PP (84.33%) clusters compared to OM (75.94%) and PC (73.81%) clusters.

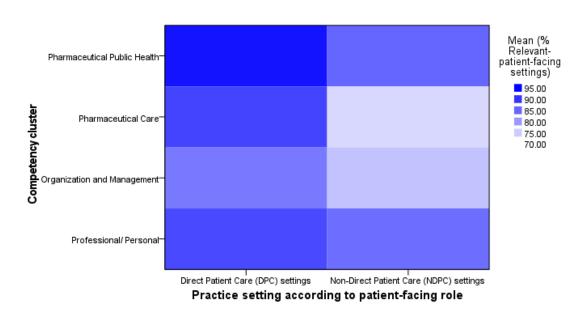


Figure 5.2: Heat map showing relevance rating between DPC and NDPC settings

Areas of practice were further analysed in Figure 5.3. It shows that respondents from regulatory organizations reported little engagement in all clusters (PPH= 76.25%, PC= 76.40%, OM= 78.28%, PP= 80.76%). Academia and industry showed little engagement in OM (academia=69.56%; industry= 78.36%) and PC (academia= 76.59%; industry= 71.38%) compared to PPH (academia= 88.88%; industry= 86.53%) and PP (academia=86.98%; industry=84.31%) clusters.

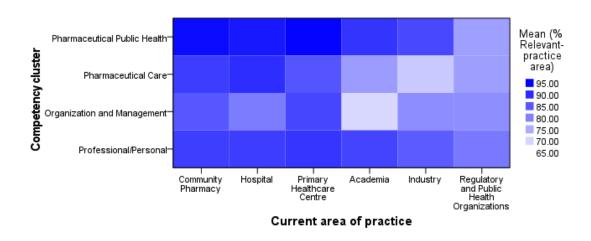


Figure 5.3: Heat map showing relevance rating between the respondents' areas of practice

5.5.5.4.2 Length working in current area of practice

Figure 5.4 shows a comparison between years working in current area of practice in relation to each competency cluster. Data of PC cluster show steady progress from early years until 10 years followed by a slight progress in the following years(≤1 years= 81.36%, 2 - 3 years=83.43%, 4 - 5 years=89.29%, 6 - 10 years=88.03%, 11 - 20= 83.34%, 21 - 30 years=85.71%, >30 years=87.11%). However, data from OM cluster show slight progress over years (≤1 years= 75.90%, 2 - 3 years=76.86%, 4 - 5 years=82.35%, 6 - 10 years=82.94%, 11 - 20= 81.99%, 21 - 30 years=85.44%, >30 years=88.54%). Data from PPH and PP clusters show a steady and a gradual increase over years.

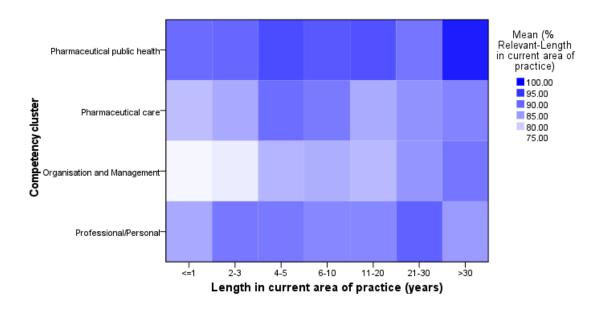


Figure 5.4: Heat map showing relevance rating between the respondents' years in current area of practice

5.5.5.4.3 Initial education

Figure 5.5 shows a comparison of the respondents' initial education in relation to each competency cluster. BPharm holders show an overall slightly high relevance to all clusters compared to PharmD holders. PharmD holders show low relevance to OM and PPH clusters (80.66%, 89.85% respectively) compared to BPharm (83.67%, 92.78% respectively).

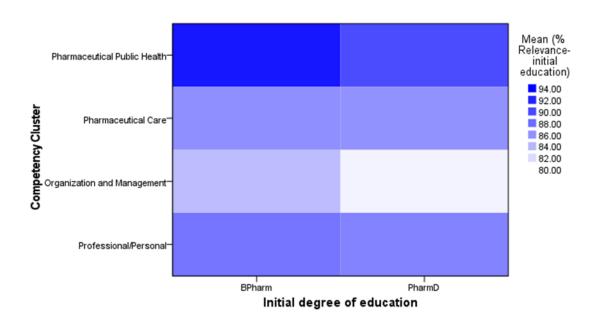


Figure 5.5: Heat map showing relevance rating between the respondents' initial education

5.5.5.4.4 Nationality

Figure 5.6 presents a comparison between respondents' nationality with each competency cluster. Data showed that non-Saudi respondents have showed a higher relevance to all clusters compared to Saudi respondents: PPH (94.59%, 85.41%, respectively), PC (87.15%, 81.88%, respectively), OM (85.20%, 74.75%, respectively) and PP (88.80, 83.81%, respectively).

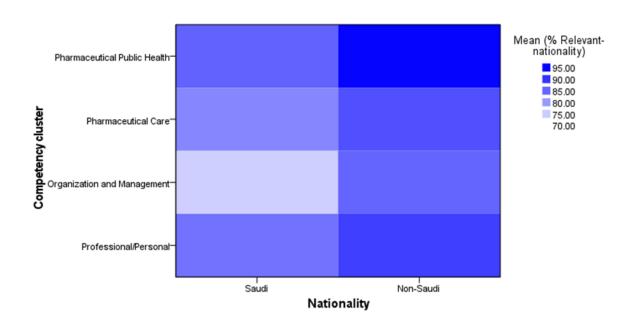


Figure 5.6: Heat map showing relevance rating between the respondents' nationality

5.5.5.4.5 Gender

Figure 5.7 presents a comparison between the gender of respondents and each competency cluster. Data showed an overall high relevance to all clusters in favour of male respondents than female respondents. Data of PPH and OM, in particular, shows high relevance of male respondents (92.34%, 83.62%, respectively) compared to female respondents (87.74%, 73.49%, respectively).

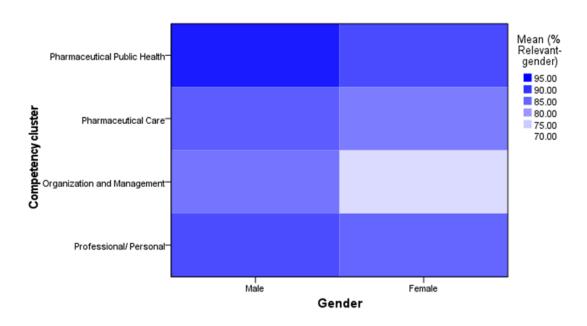


Figure 5.7: Heat map showing relevance rating between the respondents' gender

5.5.5.4.6 Gender and nationality

Figure 5.8 and Figure 5.9 present a comparison of the gender and nationality of respondents together with each competency cluster. In Figure 5.8, Saudi male respondents showed higher relevance to all clusters compared to their Saudi female counterparts, with OM showing the least relevance across all clusters in favour of female pharmacists. The Saudi male respondents showed higher relevance to all clusters compared to their Saudi female counterparts (PPH=86.94%, PC=84.74, OM=78.87, PP=85.11) and (PPH=82.83%, 77.07%, OM= 67.81%, PP=81.63%), with

the OM cluster showing the least relevance across all clusters in favour of female pharmacists.

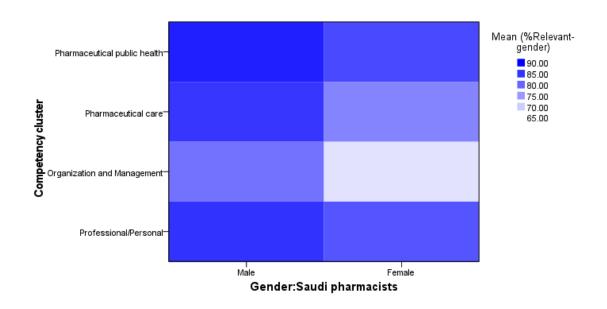


Figure 5.8: Heat map showing relevance rating between the Saudi respondents' gender

In Figure 5.9, non-Saudi female respondents showed higher relevance to PPH, PC and PP clusters (PPH=96.62%, PC=93.29%, PP=91.33%) compared to their non-Saudi male counterparts (PPH=94.34%, PC=86.41, PP=88.49%). The OM data, in particular,

showed high relevance of non-Saudi male respondents (85.37%) compared to non-Saudi female respondents (83.78%).

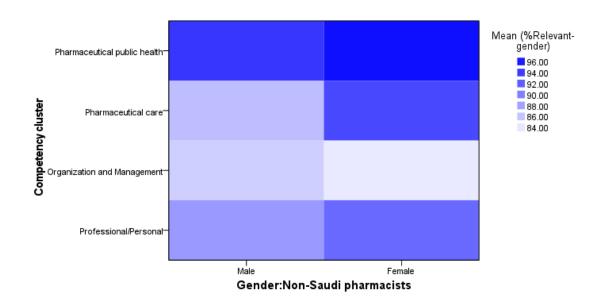


Figure 5.9: Heat map showing relevance rating between the non-Saudi respondents' gender

5.5.5.5 Responses from open-ended questions

A total of 121 open-ended responses were received from the survey respondents: 52 responses were within the PPH cluster, 27 within the PC cluster, 25 within the OM cluster and 17 within the PP cluster. The responses were analysed thematically and grouped into 35 behaviours. The identified behaviours were then mapped against behaviours of GbCF v1 and v2. Out of 35 behaviours: 22 matched the FIP GbCF v1, 11 matched the FIP GbCF v2, and two new behaviours match neither (

Table 5.6). The new behaviours are: provide point of care testing in community pharmacy for patients and community members; and discuss and agree with the patients about the appropriate generic substitution of medications according to patients' preference and or budget.

Table 5.6: List of the 35 identified behaviours from the open-ended questions mapped against the behaviours of GbCF v1 and GbCF v2

Competency cluster	Responses from open ended questions after categorisation into themes	Behavioural statements of GbCF v1 and GbCF v2
Pharmaceutical Public Health cluster (PPH)	Provide point of care testing in pharmacy for patients and community members	Matched neither: new suggested behavioural statement
	Provide health promotion services including healthy diet advice	Matched GbCF v1: 1.2 Advise on health promotion, disease prevention and control, and healthy lifestyle (e.g. vaccination)
	Provide vaccines	Matched GbCF v1: 1.2 Advise on health promotion, disease prevention and control, and healthy lifestyle (e.g. vaccination)
	Provide detailed and tailored medication counselling to the patient or carer	Matched GbCf v1: 2.1 Counsel population on the safe and rational use of medicines and devices (including the selection, use, contraindications, storage, and side effects of non-prescription and prescription medicines)
	Support patients use of health information technology or platforms	Matched GbCF v2: 3.3 Support the patient's use of health information technologies and digital communication (including IT driven health solutions)
	Support patients' needs of/ or supply from medicines in pandemics	Matched GbCFv2: 1.1 Participate in the response to public health emergencies
Pharmaceutical Care cluster (PC)	Assess medication management practices and needs, i.e. adherence	Matched GbCF v2: 4.1 Gather, analyse, research, and interpret information about the patient and patient's medicines-related needs (e.g. indication, effectiveness, safety and adherence)

Competency cluster	Responses from open ended questions after categorisation	Behavioural statements of GbCF v1 and GbCF v2
	into themes	Mattel ad ChCF v2
	Assist development of health and medication literacy	Matched GbCF v2: 9.4 Evaluate, assess, and develop health literacy
	Increase people awareness of	education and counselling on medicines and
	medications and their use	healthcare needs
	Ensure and adjust appropriate	Matched GbCF v1:
	dosage of medications	6.3 Ensure appropriate medicines, route, time,
		dose, documentation, action, form and response
		for individual patients
	Support appropriate use of	Matched GbCF v2:
	medicines	8.2 Apply therapeutic medicines monitoring and assess impact and outcomes (including objective
		and subjective measures)
	Prepare intravenous	Matched GbCF v1:
	medications	4.1 Prepare pharmaceutical medicines (e.g.
		extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations,
		appropriate formulation, procedures, raw
		materials, equipment etc.)
	Discuss and agree with the	Matched neither: new suggested behavioural
	patients about the appropriate generic	statement
	substitution of medications	
	according to patients'	
	preference and or budget	
	Provide continuity of care for	Matched GbCF v1:
	patients with chronic diseases	7.2 Ensure therapeutic medicines monitoring,
		impact and outcomes (including objective and
	Drouido hoalth and	subjective measures)
	Provide health and medication advise to patients based on	Matched GbCF v1: 8.3 Assess and diagnose based on objective and
	symptoms	subjective measures
	Diagnose and provide care for	Matched GbCf v1:
	urgent cases if needed	8.1 Apply first aid and act upon arranging follow- up care
	Review patient relevant	Matched GbCF v2:
	medication history and	4.2 Retrieve relevant patient information
	reconcile accordingly	(including drug history, or immunisation status for example) and record of allergies to medicines and Adverse Drug Reactions (ADR) in medication
		record
		9.7 Obtain, reconcile, review, maintain and update relevant patient medication and diseases history
	Use medication error systems	Matched GbCF v1:
	to report errors	5.6 Implement and maintain a dispensing error
		reporting system and a 'near misses' reporting system
Organisation and	Ensure appropriate supply of	Matched GbCF v1:
Management Cluster	stocks to minimise medication	13.3 Ensure effective stock management and
(OM)	shortage	running of service with the dispensary
	Manage stocks to minimise	Matched GbCF 1:
	medication wastage	13.3 Ensure effective stock management and running of service with the dispensary
	Assess and mange safety risks	Matched GbCF v1:
	in workplace	10.1 Demonstrate organisational and
		management skills (e.g. know, understand and
		lead on medicines management, risk
		management, self-management, time
		management, people management, project management, policy management)

Competency cluster	Responses from open ended questions after categorisation into themes	Behavioural statements of GbCF v1 and GbCF v2
	Acknowledge chain of command	Matched GbCF v1: 10.1 Demonstrate organisational and management skills (e.g. know, understand and lead on medicines management, risk management, self-management, time management, people management, project management, policy management)
	Support new staff education	Matched GbCF v1: 10.6 Support and facilitate staff training and continuing professional development
Professional/Personal cluster (PP)	Support and provide training to pharmacy residents	Matched GbCF v1: 16.2 Engage with students/interns/residents
	Demonstrate leadership and practice management skills Communicate effectively with	Matched GbCF v1: 20.2 Demonstrate leadership and practice management skills, initiative and efficiency Matched GbCf v1:
	patients	15.2 Communicate effectively with health and social care staff, support staff, patients, carer, family relatives and clients/customers, using lay terms and checking understanding
	Communicate with patients according to their social styles	Matched GbCF v1: 15.3 Demonstrate cultural awareness and sensitivity
	Collaborate in building teams and manage conflicts	Matched GbCF v2: 19.4 Engage in relationship-building with health professionals allowing conflict resolution, teamwork, communication, and consultation
	Prioritise work	Matched GbCF v2: 20.5 Prioritise work and implement innovative ideas
	Demonstrate awareness about national code of ethics and law	Matched GbCF v1: 18.1 Demonstrate awareness of local /national codes of ethics
	Demonstrate lifelong learning	Matched GbCF v2: 17.9 Demonstrate engagement/participation in professional development and lifelong learning activities
	Demonstrate awareness of medications updates, i.e. approval or recalls	Matched GbCF v1: 17.3 Be aware of and identify the new medicines coming to the market 17.6. Engage with health and medicines policies
	Participate in social media platforms to promote the right health information	Matched GbCF v2: 18.3 Where applicable, participate in digital health services that promote health outcomes and engage with digital technologies (e.g. social media platforms & mobile applications) to facilitate discussions with the patient and others
	Demonstrate awareness to use health information system at workplace to enhance performance and quality of services	Matched GbCF v2: 18.1 Identify, manage, organise, store, and share digital information 18.4 Maintain patient privacy and security of digital information related to the patient and workplace
	Use research at workplace to investigate new approaches to develop patients benefit from medications	Matched GbCF v1: 19.7 Identify, investigate, conduct, supervise and support research at workplace (enquiry-driven practice)

Competency cluster	Responses from open ended questions after categorisation into themes	Behavioural statements of GbCF v1 and GbCF v2
	Collaborate and engage with other healthcare professionals to optimise patient	Matched GbCF v2: 19.3 Engage in collaborative practice, research and service provision to optimise patient health
	therapeutic outcomes	outcomes

5.5.5.6 Relevance rating- areas of disagreement overall

Findings shows that 16 behavioural statements have a percentage above the predefined cut-off point of relevance (20%) from the PC, OM and PP clusters. These behaviours represent two from "compounding medicines" competency group, two from "patient consultation and diagnosis", four from "budget and reimbursement", two from "human resources and management", four from "procurement" and two from "quality assurance and research in workplace" (Table 5.7).

Table 5.7: Behavioural statements of the FIP GbCF v1 that receive "not relevance" above the predefined cut-off point

Competency group	Behavioural statement	Not relevant responses (%)				
Custer 2: Pharmac	eutical care (PC) competencies					
4. Compounding medicines	4.1. Prepare pharmaceutical medicines (e.g. extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)	26.1%				
	4.2. Compound under the good manufacturing practice for pharmaceutical (GMP) medicines	23.2%				
8. Patient	8.1. Apply first aid and act upon arranging follow-up care	23.8%				
consultation and diagnose based on objective and subjective measures diagnosis						
Cluster 3: Organisa	ation and Management (OM) competencies					
9. Budget and	9.2. Effectively set and apply budgets	22.6%				
reimbursement	9.3. Ensure appropriate claim for the reimbursement	26.1%				
	9.4. Ensure financial transparency	25.1%				
	9.5. Ensure proper reference sources for service reimbursement	26.2%				
10. Human	10.2. Identify and manage human resources and staffing issues	23.9%				
resources and management	10.4. Recognise and manage the potential of each member of the staff and utilise systems for performance management (e.g. carry out staff appraisals)	20.5%				
12. Procurement	12.3. Efficiently link procurement to formulary, to push/pull system (supply chain management) and payment mechanisms	20.3%				
	12.4. Ensure there is no conflict of interest	20.9%				
	12.6. Supervise procurement activities	21.8%				
	12.7. Understand the tendering methods and evaluation of tender bids	23%				
Cluster 4: Profession	onal/ Personal (PP) competencies	•				
19. Quality assurance and research in the	19.1. Apply research findings and understand the benefit risk (e.g. pre- clinical, clinical trials, experimental clinical-pharmacological research and risk management)	20.5%				
workplace	19.4. Ensure appropriate quality control tests are performed and managed appropriately	20.1%				

To evaluate the association between the 16 behaviours of disagreement and respondents' characteristics, these behaviours were further analysed using Pearson's Chi-square (χ^2) test in relation to the respondents' area of practice, length

of time in practice, initial education, nationality and gender, as described in the following section.

5.5.5.6.1 Areas of disagreement—per area of practice

A Pearson's Chi-square (χ^2) test showed that eight out of the 16 behavioural statements of disagreement over relevancy were associated with the area of pharmacy practice (P<0.05) (Table 5.8). A higher percentage of respondents working in community pharmacy were more likely to perceive behaviours in the PC (4.1, 4.2, 8.1, 8.3) and the OM (10.2, 12.7) as being "not relevant" to their practice compared to respondents working in other practice settings. Respondents working in hospitals were more likely (compared to other settings) to perceive behaviour in the OM (9.4, 12.6) as being "not relevant".

Table 5.8: Distribution of the 'not relevant' responses for the 16 behaviours of disagreement in relation to area of practice

			Area of p	harmacy p	ractice (%	N 'not-r	elevant')		
Behavioural statements of disagreement		Commu nity pharma cy	Hospi tal	Primar y healthc are clinics	Acade mia	Indus try	Regulato ry organisat ions	Oth er	χ²- value P- value
Cluster2: Pha	rmaceutical car	e (PC) comp	etencies			•	•	•	
4.Compou	4.1 Prepare	48.5	14.7	8.1	6.6	15.4	4.4	2.2	χ²=27.
nding	pharmaceuti								919
medicine	cal medicines								P<0.00
competenc	(e.g.								1
y group	extemporane ous, cytotoxic medicines), determine the requirement s for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)								
	4.2. Compound under the good manufacturin	40.5	22.3	8.3	5.8	14.9	4.1	4.1	χ ² =16. 298 P=0.01 2

			Area of i	pharmacy _I	ractice (%	N 'not-r	elevant')		
Behavioural s	statements of	Commu	Hospi	Primar	Acade	Indus	Regulato	Oth	χ²-
disagreement		nity pharma cy	tal	y healthc are clinics	mia	try	ry organisat ions	er	value P- value
	g practice for pharmaceuti cal (GMP) medicines								
8. Patient consultatio n and diagnosis competenc y group	8.1. Apply first aid and act upon arranging follow-up care	31.5	30.6	4	7.3	15.3	5.6	5.6	χ ² =26. 977 P<0.00 1
	8.3. Assess and diagnose based on objective and subjective measures	31.8	29	4.7	8.4	16.8	5.6	3.7	χ ² =17. 256 P=0.00 8
Cluster 3: Org	ganisation and n	nanagemen	t (OM) co	ompetenci	es				
9. Budget and reimbursem ent competency group	9.2. Effectively set and apply budgets	35.6	39.8	5.1	6.8	7.6	3.4	1.7	χ ² =6.3 41 P=0.38 6
	9.3. Ensure appropriate claim for the reimbursem ent	34.6	39.7	3.7	7.4	9.6	3.7	1.5	χ ² =8.9 03 P=0.17 9
	9.4. Ensure financial transparency	35.1	37.4	3.1	9.9	8.4	3.1	3.1	χ ² =15. 650 P=0.01
	9.5. Ensure proper reference sources for service reimbursem ent	33.6	37.2	5.8	8.8	8.8	3.6	2.2	χ ² =10. 173 P=0.11 8
10. Human resources and managemen t competency group	10.2. Identify and manage human resources and staffing issues	34.4	29.6	4.8	9.6	13.6	6.4	1.6	χ ² =13. 946 P=0.03 0
	10.4. Recognise and manage the potential of each member of	36.4	30.8	6.5	8.4	11.2	5.6	0.9	χ ² =5.9 60 P=0.42 8

Area of pharmacy practice (% N 'not-relevant')									
	Behavioural statements of disagreement		Hospi tal	Primar y healthc are clinics	Acade mia	Indus try	Regulato ry organisat ions	Oth er	χ²- value P- value
	the staff and utilise systems for performanc e manageme nt (e.g. carry out staff appraisals)								
12.Procure ment competency group	12.3. Efficiently link procureme nt to formulary, to push/pull system (supply chain manageme nt) and payment mechanism s	29.2	36.8	5.7	9.4	11.3	4.7	2.8	χ ² =12. 449 P=0.05 3
	12.4. Ensure there is no conflict of interest	40.4	31.2	2.8	9.2	9.2	3.7	3.7	χ ² =9.2 57 P=0.16 0
	12.6. Supervise procureme nt activities	32.5	33.3	3.5	10.5	12.3	4.4	3.5	χ ² =15. 974 P=0.01
	12.7. Understand the tendering methods and evaluation of tender bids	35.8	33.3	4.2	10.8	8.3	5.8	1.7	χ ² =13. 706 P=0.03 3
	fessional/ Perso				27	12.1	1 4 7	0.0	v ² -2 4
19. Quality assurance and research in workplace competency group	19.1. Apply research findings and understand the benefit risk (e.g. pre-clinical, clinical trials, experiment al clinical-pharmacolo gical	42.1	29.9	6.5	3.7	12.1	4.7	0.9	χ ² =2.4 18 P=0.87 8

		Area of pharmacy practice (% N 'not-relevant')							
Behavioural statements of disagreement		Commu nity pharma cy	Hospi tal	Primar y healthc are clinics	Acade mia	Indus try	Regulato ry organisat ions	Oth er	χ²- value P- value
	research and risk manageme nt)								
	19.4. Ensure appropriate quality control tests are performed and managed appropriate ly	42.9	22.9	7.6	4.8	14.3	5.7	1.9	χ ² =8.3 19 P=0.21 6

5.5.5.6.2 Areas of disagreement—per length in practice

Table 5.9 shows respondents with 11-20 years length in practice were more likely to perceive behaviour 4.1 " prepare pharmaceutical medicines (e.g. extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)" in the PC as "not-relevant" to their practice (P<0.05).

Table 5.9: Distribution of the 'not relevant' responses for the 16 behaviours of disagreement in relation to length in practice

Behavioural state	monts of	≤1	2- 3	4- 5	6- 10	'not-rele	21-	>30	χ²-value
disagreement	illents of	years	years	years	years	20	30	years	P-value
uisagi eeillelit						years	years		
	ceutical care (PC) co								r
4.Compounding	4.1 Prepare	6.6	9.6	9.6	15.4	47.1	10.3	1.5	χ²=16.926
medicine	pharmaceutical								P=0.010
competency	medicines (e.g.								
group	extemporaneous,								
	cytotoxic								
	medicines),								
	determine the								
	requirements for								
	preparation								
	(calculations,								
	appropriate								
	formulation,								
	procedures, raw								
	materials,								
	equipment etc.)	7.4	40.7	0.0	47.4	47.4	- 0	4 7	2 0 407
	4.2. Compound	7.4	10.7	9.9	17.4	47.1	5.8	1.7	$\chi^2 = 9.187$
	under the good								P=0.163
	manufacturing								
	practice for								
	pharmaceutical								
8. Patient	(GMP) medicines	4.8	16.1	13.7	21.8	37.1	4.8	1.6	χ ² =6.430
consultation	8.1. Apply first aid and act upon	4.8	10.1	13.7	21.8	37.1	4.8	1.0	χ=6.430 P=0.377
and diagnosis	arranging follow-								P-0.577
•									
competency group	up care 8.3. Assess and	5.6	12.1	10.3	22.4	41.1	6.5	1.9	χ²=2.693
P. oah	diagnose based	3.0	12.1	10.3	22.4	41.1	0.5	1.9	χ -2.093 P=0.846
	on objective and								r =0.040
	subjective								
	measures								
Cluster 3: Organis	sation and managem	ent (OM) compe	tencies	l .	1	l .	1	<u>l</u>
9. Budget and	9.2. Effectively	9.3	8.5	13.6	23.7	39	4.2	1.7	χ²=3.382
reimbursement	set and apply	5.5	5.5]	P=0.760
competency	budgets								
group									
<u> </u>									
	9.3. Ensure	8.1	9.6	11.8	22.8	39	7.4	1.5	χ²=1.478
	appropriate								P=0.961

			Length	in pract	ice (% N	'not-rele	evant')		
Behavioural state	monts of	≤1	2- 3	4- 5	6- 10	11-	21-	>30	χ²-value
disagreement	ments or	years	years	years	years	20	30	years	P-value
uisagreement						years	years		
	claim for the reimbursement								
	9.4. Ensure	9.2	10.7	13	21.4	38.9	5.3	1.5	χ²=2.038
	financial	3.2	10.7	13	21.4	36.9	3.3	1.5	χ =2.038 P=0.916
	transparency								1 0.510
	9.5. Ensure	5.8	12.4	13.9	23.4	36.5	6.6	1.5	χ²=0.997
	proper								P=0.986
	reference								
	sources for								
	service								
40.11	reimbursement	0.6	444	44.2	22.2	22.6		4.6	2 4 420
10. Human	10.2. Identify	9.6	14.4	11.2	23.2	33.6	6.4	1.6	χ²=4.129 P=0.659
resources and management	and manage human								r-0.039
competency	resources and								
group	staffing issues								
• •	0 33.55								
	10.4. Recognise	9.3	15	12.1	23.4	33.6	5.6	0.9	χ²=4.012
	and manage the								P=0.675
	potential of								
	each member of								
	the staff and								
	utilise systems for performance								
	management								
	(e.g. carry out								
	staff appraisals)								
12.Procurement	12.3. Efficiently	10.4	15.1	14.2	17	34	7.5	1.9	χ²=6.608
competency	link								P=0.359
group	procurement to								
	formulary, to								
	push/pull system (supply								
	chain								
	management)								
	and payment								
	mechanisms								
	12.4. Ensure	10.1	4.6	12.8	22	34.9	4.6	1.8	$\chi^2 = 3.702$
	there is no								P=0.717
	conflict of								
	interest	0.6	12.2	11 4	22.7	25.4	F 2	1.0	v2-2 040
	12.6. Supervise procurement	9.6	13.2	11.4	23.7	35.1	5.3	1.8	χ ² =2.840 P=0.829
	activities								F-0.023
	12.7.	7.5	13.3	10.8	22.5	40	4.2	1.7	χ²=3.826
	Understand the		_5.5	_0.5					P=0.700
	tendering								
	methods and								
	evaluation of								
01	tender bids	<u> </u>	<u> </u>						
	ional/ Personal (PP)	1		12.4	26.2	24.0	T 7 F	0.0	.2 1 000
19. Quality	19.1. Apply	5.6	12.1	13.1	26.2	34.6	7.5	0.9	χ ² =1.909
assurance and research in	research findings and								P=0.928
workplace	understand the								
competency	benefit risk (e.g.								
group	pre-clinical,								
	clinical trials,								
	,	1	1	1	1	ı	l	ı	

	Length in practice (% N 'not-relevant')								
Behavioural statements of disagreement		≤1 years	2- 3 years	4- 5 years	6- 10 years	11- 20 years	21- 30 years	>30 years	χ²-value P-value
	experimental clinical- pharmacological research and risk management)								
	19.4. Ensure appropriate quality control tests are performed and managed appropriately	9.5	10.5	9.5	22.9	40	5.7	1.9	χ ² =3.240 P=0.778

5.5.5.6.3 Areas of disagreement—per initial education

Table 5.10 shows that the respondents holding a BPharm degree were more likely to perceive behaviour 12.3 "efficiently link procurement to formulary, to push/pull system (supply chain management) and payment mechanisms" in the OM as "not-relevant" to their practice (P<0.05).

Table 5.10: Distribution of the 'not relevant' responses for the 16 behaviours of disagreement in relation to initial education

Behavioural statements of disagreement		Initial educat relevant')	ion (% N 'not-	χ²- value p-value	
		BPharm	PharmD		
Cluster 2: Pharmaceutical	Care (PC) competencies		•	,	
4. Compounding medicines competency group	4.1. Prepare pharmaceutical medicines (e.g.	87	13	χ ² =1.115 P=0.291	
Promb	extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)				
	4.2. Compound under the good manufacturing practice for pharmaceutical (GMP) medicines	84.2	15.8	χ ² =0.015 P=0.311	
8. Patient consultation and diagnosis competency group	8.1. Apply first aid and act upon arranging follow-up care	81.5	18.5	χ ² =0.450 P=0.502	
	8.3. Assess and diagnose based on objective and subjective measures	84.8	15.2	χ ² =0.072 P=0.788	
Cluster 3: Organisation ar	nd Management (OM) comp	etencies	•	•	
9. Budget and reimbursement	9.2. Effectively set and apply budgets	83.5	16.5	χ²=0.007 P=0.933	
competency group	9.3. Ensure appropriate claim for the reimbursement	84.5	15.5	χ ² =0.050 P=0.823	
	9.4. Ensure financial transparency	82.5	17.5	χ ² =5.540 P=0.236	
	9.5. Ensure proper reference sources for service reimbursement	85	15	χ ² =0.138 P=0.710	
10. Human resources and management competency group	10.2. Identify and manage human resources and staffing issues	79.8	20.2	χ ² =1.433 P=0.231	
	10.4. Recognise and manage the potential of each member of the	81.3	18.8	χ ² =0.473 P= 0.492	

Behavioural statements of	of disagreement	Initial educat relevant')	ion (% N 'not-	χ²- value p-value
			PharmD	
	staff and utilise systems			
	for performance			
	management (e.g. carry			
	out staff appraisals)			
12. Procurement	12.3. Efficiently link	76.3	23.8	χ²=4.139
competency group	procurement to			P=0.042
	formulary, to push/pull			
	system (supply chain			
	management) and			
	payment mechanisms			
	12.4. Ensure there is no	77.8	22.2	χ ² =2.675
	conflict of interest			P=0.102
	12.6. Supervise	81	19	χ ² =0.626
	procurement activities			P=0.429
	12.7. Understand the	81.8	18.2	χ²=0.322
	tendering methods and			P=0.571
	evaluation of tender			
	bids			
Cluster 4: Professional/Pe	ersonal competencies			
19. Quality assurance	19.1. Apply research	83.3	16.7	χ²=0.019
and research in	findings and understand			P=0.892
workplace competency	the benefit risk (e.g.			
group	pre-clinical, clinical			
	trials, experimental			
	clinical-pharmacological			
	research and risk			
	management)			
19.4. Ensure		82.6	17.4	χ²=0.123
	appropriate quality			P=0.727
	control tests are			
	performed and			
	managed appropriately			

5.5.5.6.4 Areas of disagreement—per nationality

Table 5.11 shows that non-Saudi respondents were more likely to perceive behaviours in the PC (8.1, 8.3) and the OM (9.2, 9.3, 9.4, 9.5, 10.2, 10.4, 12.6, 12.7) as "not relevant" to their practice (P<0.05). Table 5.11 shows also that Saudi respondents were more likely to perceive behaviour 12.3 from the OM as "not-relevant" to their practice (P<0.05).

Table 5.11: Distribution of the 'not relevant' responses for the 16 behaviours of disagreement in relation to nationality

Behavioural statements of disagreement		Nationality	(% N 'not-	χ²- value
		relevant')		p-value
		Saudi	Non-Saudi	
Cluster 2: Pharmaceutica	Care (PC) competencies			
4. Compounding	4.1. Prepare	28.7	71.3	$\chi^2 = 2.744$
medicines competency	pharmaceutical			P=0.098
group	medicines (e.g.			
	extemporaneous,			
	cytotoxic medicines),			
	determine the			
	requirements for			
	preparation			
	(calculations,			
	appropriate			
	formulation,			
	procedures, raw			
	materials, equipment			
	etc.)	26.4	62.6	χ²=0.247
	4.2. Compound under the good manufacturing	36.4	63.6	χ=0.247 P=0.619
	practice for			P=0.019
	pharmaceutical (GMP)			
	medicines			
8. Patient consultation	8.1. Apply first aid and	45.2	54.8	χ²=8.209
and diagnosis	act upon arranging	43.2	54.0	P=0.004
competency group	follow-up care			1 -0.004
competency group	8.3. Assess and diagnose	47.7	52.3	χ ² =10.350
	based on objective and		0 = 10	P=0.001
	subjective measures			
Cluster 3: Organisation a	nd Management (OM) comp	etencies		
9. Budget and	9.2. Effectively set and	44.1	55.9	χ²=6.200
reimbursement	apply budgets			P=0.013
competency group	9.3. Ensure appropriate	43.4	56.6	χ²=6.448
	claim for the			P=0.011
	reimbursement			
	9.4. Ensure financial	47.3	52.7	χ²=12.773
	transparency			P<0.001
	9.5. Ensure proper	46.7	53.3	χ²=12.303
	reference sources for			P<0.001
	service reimbursement			
10. Human resources	10.2. Identify and	44.8	55.2	χ ² =7.744
and management	manage human			P=0.005
competency group	resources and staffing			
	issues			

Behavioural statements of disagreement		Nationality (% relevant')	6 N 'not-	χ²- value p-value
		Saudi	Non-Saudi	-
	10.4. Recognise and manage the potential of each member of the staff and utilise systems for performance management (e.g. carry out staff appraisals)	45.8	54.2	χ ² =7.623 P= 0.006
12. Procurement competency group 12.3. Efficiently link procurement to formulary, to push/pull system (supply chain management) and payment mechanisms		50.9	49.1	χ ² =15.952 P<0.001
	12.4. Ensure there is no conflict of interest	45	55	χ ² =6.686 P=0.010
	12.6. Supervise procurement activities	49.1	50.9	χ ² =13.837 P<0.001
	12.7. Understand the tendering methods and evaluation of tender bids	45.8	54.2	χ ² =8.886 P=0.003
Cluster 4: Professional/Po	ersonal competencies			·
19. Quality assurance and research in workplace competency group	19.1. Apply research findings and understand the benefit risk (e.g. pre-clinical, clinical trials, experimental clinical-pharmacological research and risk management)	42.1	57.9	χ ² =3.417 P=0.065
	19.4. Ensure appropriate quality control tests are performed and managed appropriately	41	59	χ ² =2.435 P=0.119

5.5.5.6.5 Areas of disagreement—per gender

Table 5.12 shows that male respondents were more likely to perceive behaviours in the OM (9.2, 9.3, 9.4, 9.5, 10.2, 10.4, 12.3, 12.6, 12.7) as "not relevant" to their practice (P<0.05). Table 5.12 shows also that male respondents were more likely to perceive behaviour 19.1 from the PP as 'not-relevant' to their practice (P<0.05).

Table 5.12: Distribution of the 'not relevant' responses for the 16 behaviours of disagreement in relation to gender

Behavioural statements of disagreement		Gender (% N	'not-relevant')	χ²- value p-value
		Male	Female	- P value
Cluster 2: Pharmaceutical	Care (PC) competencies		1	•
4. Compounding medicines competency group	4.1. Prepare pharmaceutical medicines (e.g. extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)	84.6	15.4	χ ² = 2.316 P=0.128
4.2. Compound under the good manufacturing practice for pharmaceutical (GMP) medicines		81	19	χ ² = 0.083 P=0.774
8. Patient consultation and diagnosis	8.1. Apply first aid and act upon arranging	75	25	χ ² = 2.627 P=0.105
	follow-up care 8.3. Assess and diagnose based on objective and subjective measures	74.8	25.2	χ ² = 2.379 P=0.123
Cluster 3: Organisation ar	nd Management (OM) comp	etencies		
9. Budget and reimbursement	9.2. Effectively set and apply budgets	72.9	27.1	χ ² = 4.948 P=0.026
competency group	9.3. Ensure appropriate claim for the reimbursement	72.8	27.2	$\chi^2 = 6.114$ P=0.013
	9.4. Ensure financial transparency	72.5	27.5	χ ² = 6.261 P=0.012
	9.5. Ensure proper reference sources for service reimbursement	70.1	29.9	χ ² = 11.651 P=0.001
10. human resources and management competency group	10.2. Identify and manage human resources and staffing issues	73.6	26.4	χ ² = 4.321 P=0.038
	10.4. Recognise and manage the potential of each member of the	69.2	30.8	χ ² = 10.056 P=0.002

Behavioural statements of disagreement		Gender (% N 'n	ot-relevant')	χ²- value p-value
	staff and utilise systems		Female	
	staff and utilise systems			
	for performance			
	management (e.g. carry			
	out staff appraisals)			
12. Procurement	12.3. Efficiently link	67.9	32.1	$\chi^2 = 12.312$
competency group	procurement to			P<0.001
	formulary, to push/pull			
	system (supply chain			
	management) and			
	payment mechanisms			
	12.4. Ensure there is no	73.4	26.6	χ²=3.856
	conflict of interest			P=0.050
12.6. Supervise		71.9	28.1	$\chi^2 = 6.068$
procurement activities				P=0.014
	12.7. Understand the	70.8	29.2	$\chi^2 = 8.345$
	tendering methods and			P=0.004
	evaluation of tender			
	bids			
Cluster 4: Professional/Pe	ersonal (PP) competencies			
19. Quality assurance	19.1. Apply research	72	28	$\chi^2 = 5.554$
and research in	findings and understand			P=0.018
workplace competency	the benefit risk (e.g.			
group	pre-clinical, clinical			
	trials, experimental			
	clinical-pharmacological			
	research and risk			
	management)			
	19.4. Ensure	76.2	23.8	$\chi^2 = 1.244$
	appropriate quality			P=0.265
	control tests are			
	performed and			
	managed appropriately			

5.5.6 Discussion

To our knowledge, this is the first study to explore the relevance of the FIP GbCF in Saudi pharmacy practice. This national survey investigated the relevance of the FIP GbCF v1 to the practice of pharmacists from different practice settings: community pharmacy, hospitals, primary health care clinics, pharmaceutical industry, academia and others.

The survey shows a broad agreement on relevance to practice for 84% of behaviours included in the GbCF v1. The PPH cluster scored the highest percentage of relevant responses (91.42%), followed by the PP cluster (87.08%) and the PC cluster (85.34%). On the other hand, the OM cluster scored the lowest percentage of relevant responses by the study population (81.60%). These findings are consistent with other global studies, which have shown similar findings on relevancy to the FIP GbCF (Udoh et al., 2018; Al-Haqan et al., 2021; Arakawa et al., 2020b).

In this study, the level of the relevance of OM competencies was low since pharmacists receive little or no training on these competencies in either undergraduate or post- graduate education (Asiri, 2011; Alkatheri et al., 2019). This lack raises concerns about pharmacists' competencies to apply these skills in their practice especially when they undertake management roles. Al-Arifi (2013) reported that community pharmacists mostly acquire their managerial skills on the job and that few had post-graduate training in management or leadership. The author suggests that the lack of formalised training programmes contributes to the difference in skills across the study population. Hence, incorporating these competencies at foundation level is highly warranted to enable pharmacists' transition to leadership roles and ensure a consistently high calibre of professional performance (Al-Arifi, 2013).

Respondents from DPC settings were more likely to perceive behaviours included in the FIP GbCF as relevant to their practice compared to respondents from the NDPC settings. This might be related to their scope of practice, which involves more responsibilities within health promotion, medicines compounding, dispensing and

procurement activities (Almeman and Al-jedai, 2016). The low relevance noted in "budget and reimbursement", "human resources management" and "procurement" competency groups might be related to the fact that these responsibilities are conducted at the level of organisation or sector rather than on departmental level. Respondents rated low relevance for "patient consultation and diagnosis" behaviours which might be explained in that patient diagnosis and assessment is not a common nor a regulated practice for pharmacists in Saudi Arabia (Al-jedai et al., 2016; Almeman and Al-jedai, 2016). Interestingly, recent local research reported that the provision of such services in community pharmacies is increasingly desired by consumers (Almansour et al., 2020a; Almansour et al., 2020b; Rasheed et al., 2020).

Respondents also scored low relevance for "quality assurance and research in workplace" behaviours. This is consistent with AlRuthia et al (2018) finding that pharmacists' participation in pharmacy practice research is limited, despite a high proportion working in DPC roles. Most pharmacy practice research is lead mainly, not by practising pharmacists, but by researchers who are away from practice, including academics with claims that this is primarily to achieve academic promotion or by students to fulfil their graduation requirements (Almeman and Aljedai, 2016). This finding raises concerns about pharmacists' research skills and the presence of a research supporting environment, time and resources for practising pharmacists in Saudi Arabia. Interestingly, these findings are broadly similar to the situation Alhaqan et al (2020) reported in Kuwait, a neighbouring country with similar pattern and scope of pharmacy practice.

While the area of practice was reported previously as a factor influencing pharmacists' perception of the FIP GbCF items relevancy (Udoh et al., 2018; Al-Haqan et al., 2021; Arakawa et al., 2020b), this study adds to the increasing body of knowledge that the nationality and gender of pharmacists may influence their perceptions of the behaviours included in the FIP GbCF. Of the 16 "not relevant" behaviours, 12 and 10 of them were associated with nationality and gender, respectively.

Figure 5.6 shows that non-Saudi pharmacists perceived all clusters to be more relevant compared to Saudi pharmacists. This might reflect their practice experience in their home countries, especially as the majority, particularly those from Eastern Mediterranean countries, must practise locally for at least two years before they are allowed to travel and practise in Saudi Arabia (Al-jedai et al., 2016; Almaghaslah et al., 2018). However, the analysis of not relevant responses showed observed significant non-relevancy associated with non-Saudi pharmacists for behaviours within the following competency groups: "patient consultation and diagnosis", "budget and reimbursement", "human resources and management", and "procurement". Non-relevance in the behaviours of the "patient consultation and diagnosis" competency may have been perceived because the initial education of non-Saudis included little or no pharmacy practice or clinical-based learning to inform their practice equivalent to the local PharmD curricula, the dominant curricula currently, where pharmacy practice and clinical pharmacy courses and training are heavily weighted (Al-jedai et al., 2016). Moreover, the significant nonrelevancy observed in "budget and reimbursement", "human resources and management", and "procurement" competency groups was associated significantly with male non-Saudi pharmacists. This may indicate that Saudi pharmacists primarily hold management and leadership roles. However, a comparison between male and female Saudi pharmacists showed higher relevance to OM competencies in favour of male pharmacists (78.87% male to 67.81% female). Therefore, further study on the impact of gender on leadership and management roles in pharmacy is suggested.

5.5.6.1 Implications

Considering the Saudi context, where almost 65% of pharmacists are non- Saudi and 81% of pharmacists are male, the findings of this study suggest a variation in competencies and of professional performance between Saudi and non- Saudi on the one hand and between male and female pharmacists on the other hand. Importantly, this finding indicates that sitting a licensure exam where merely minimum knowledge is measured to permit registration might not be enough. The

development of a national competency framework with the core competencies required for performance excellence could provide a means to reduce the degree of variation shown in this study. It will additionally inform the development of competency-based education, not only to achieve the desired competencies for local pharmacists, but also of a national assessment and training programme for overseas pharmacists in order to establish a consistent performance before undertaking the licensure exam. Moreover, the availability of a competency framework would indeed inform the licensure exam and provide the foundations for new continuing education and continuing professional development activities (Mucalo et al., 2016). It would also support practising pharmacists to identify learning needs to attain and maintain fitness to practise.

Currently, as the Saudi government is implementing major modernisation reforms, including in the pharmacy sector, developing a national competency framework that meets the government's plans for an expansion of pharmaceutical care roles in community pharmacies and the localisation of pharmacists would be of paramount importance in terms of fulfilling the government's 2030 Vision plans (Saudi Vision 2030, 2017; Alomi, 2017). Addressing the country's needs for a qualified and competent pharmacy workforce to provide the new expanded roles in community settings requires education to be developed with respect to the needs-based competencies. By doing so, a huge reserve of local pharmacists would be equipped with the appropriate learning and competencies to meet the government plans (Al-Hanawi et al., 2019).

The methods employed in this study provide a replicable example to other regional or global pharmacy practice researchers on how the FIP GbCF can be used as a first step to develop a country-specific competency framework. However, specific attention should be paid to local contexts, as local healthcare needs and other priorities will determine the competencies required for equipping pharmacists to meet local needs.

As an ideal first step to develop a country-level competency framework, the quantitative and qualitative findings from the study will serve as a basis to develop a national competency framework for foundation level pharmacists in Saudi Arabia. Future work involves conducting an expert panel to establish competency framework development based on local healthcare needs, followed by a validation of the draft framework.

5.5.6.2 Limitations

This study has some limitations. The utilisation of the snowballing sampling approach may limit the generalizability of the findings. Despite that, the number of responses received following the snowballing approach exceeded the formally calculated sample size required to ascertain the generalisability of the findings. The low representation of academia, pharmaceutical industry and regulatory organisations may not provide a clear picture about their professional practice nor competencies required to fulfil their roles. Moreover, the lack of a specific definition of foundation-level pharmacy practice in Saudi Arabia may not provide a clear picture about the progress of pharmacists' performance over years and the relevance of the FIP GbCF to the practice of the foundation level pharmacists in the country. Additionally, the use of a self-completed survey may lead to self-reporting bias by the respondents. The use of multiple reminders may have led to duplicated responses, particularly given that the survey platform did not provide a feature to prevent this. Therefore, the results should be interpreted with caution.

5.5.7 Conclusion

This study investigated the relevance of the FIP GbCF in the Saudi pharmacy practice environment. The study found that competencies included in the GbCF v1 are relevant to pharmacy practice in the study population. However, some competencies and behaviours of the GbCF v1 require modification to be appropriate for the local needs of Saudi pharmacy practice and to develop a country-specific competency framework. The findings from this exercise will be used as a base to develop a foundation-level competency framework to inform the

pharmacy education and professional development process in Saudi Arabia, equipping pharmacists to best meet local healthcare needs.

5.6 Phase 2b: Developing a national foundation level pharmacy competency framework

5.6.1 Study design

As described previously in Chapter 3 (section 3.4.3.1.1), a modified NGT was utilised as a consensus method to develop a profession-wide competency framework for foundation level pharmacists in Saudi Arabia.

5.6.2 Survey development

The initial suggested items of the foundation competency framework comprised 126 behavioural statements, of which, 124 were fully adopted from the FIP GbCF v2 (International Pharmaceutical Federation, 2020b) and two were from the previous phase of this research (Phase 2a), namely: "provide point of care testing for patients and communities (e.g. blood sugar (BS), blood pressure (BP), international normalized ratio (INR))" and "discuss and agree with the patients about the appropriate generic substitution of medicines according to patients' preference and/ or budget".

To facilitate ranking and analysis, a Qualtrics survey platform (QualtricsXM- version November 2021) was used to develop a self-administered online questionnaire (Appendix 7). The online survey comprised five pages with 129 questions: 126 behavioural statements, 2 suggested behaviours and 1 open question. The first page included a cover page providing participants with background information and the study purpose, followed by the 126 behavioural statements, with each cluster per page. The presentation of the statements followed the FIP GbCF v2 structure: 23 competency groups under four clusters: PPH, PC, OM and PP. The two suggested behaviours were included separately and added to the survey. At the end of each cluster, open-ended question was included for the experts to offer any additional comments or behaviours that they thought were useful or relevant. All of the questionnaire items were written in English.

The survey was designed to be submitted only if the respondents had replied to all survey questions within each cluster. This helped to prevent occurrence of missing values within the responses of the survey. If there was unanswered question, the respondent was alerted when clicking the submission button by stating which question(s) were missed.

5.6.3 Sampling and selection

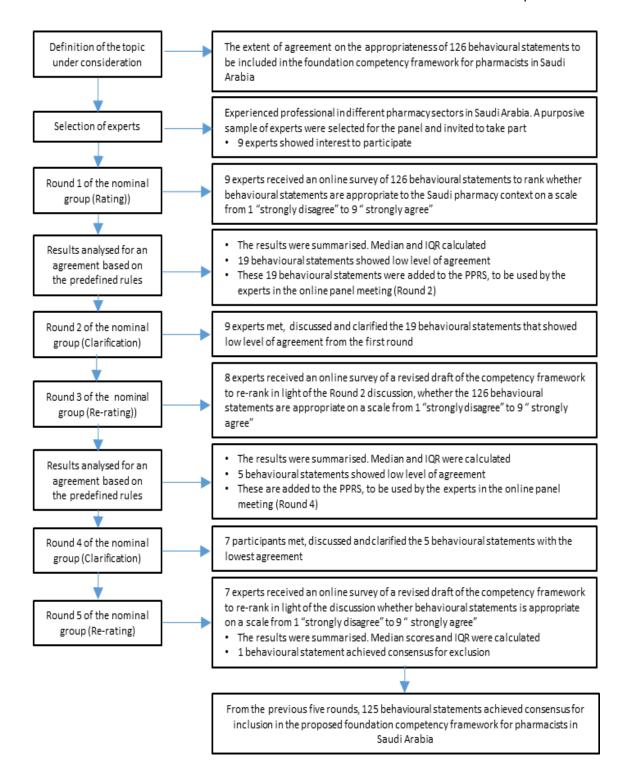
The key stakeholders for the study were selected based on the specific categories suggested by the FIP for pharmacy education quality assurance (International Pharmaceutical Federation, 2014). Given that the group size in NGT typically comprises 8-12 members (Black, 2006; Jones and Hunter, 1995; McMillan et al., 2016), a purposive sampling method was employed to recruit a group of 9 experts. The selection of panel members was guided by several experts in Saudi Arabia based on the recognition of their expertise in different pharmacy sectors in Saudi Arabia. The SCPP was also consulted to maximise the inclusion of relevant key informants from different areas of pharmacy practice in Saudi Arabia. The inclusion criteria were pharmacists with recognised expertise in different pharmacy sectors in Saudi Arabia, key informants as determined by the FIP pharmacy education quality assurance categories (FIP, 2014), willing to participate and provide informed consent, including audio-recording of the panel discussion.

Most key informants were identified and accessed in cooperation with the SCPP and, with their approval, the SCPP provided their contact details to contact them directly. Emails were sent to the potential participants explaining the study aim and purpose to ask for voluntary participation. One to two key informants from each of the FIP quality assurance categories were contacted to participate in the NGT. Once potential participants expressed their willingness to participate, they were sent the study information sheet and consent form to sign before conducting the NGT.

5.6.4 Data collection

NGT typically consists of multiple rounds in which experts rate, discuss, and re-rate a list of items to determine the extent of their agreement (measure consensus) and

resolve disagreements (develop consensus) on the proposed list. Figure 5.10 provides a summary of the modified NGT data collection process. The first stage of the study, consensus measurement, used electronic correspondence to enable rating and re-rating of the list of competencies and behavioural statements of the initial suggested competency framework. This happened in Round 1, 3 and 5 of this study. The second stage, consensus development, consisted of panel meetings to enable experts to clarify and discuss behavioural statements with the lowest agreement. This happened in Round 2 and 4 of this study. The details, however, are described in the following sections.



Abbreviations: Interquartile range (IQR), Personalised Panellist Rating Sheet (PPRS)

Figure 5.10: Process and composition of NGT rounds in this study

5.6.4.1 Consensus measurement procedure

One month before the panel meeting, the online survey was emailed to the experts for them to privately rank the list of behavioural statements. Experts were asked to rate the appropriateness of each statement to the Saudi pharmacy practice context using a 9-point Likert scale ranging from strongly disagree (value=1) to strongly agree (value=9). The choice of a 9-point Likert scale was to provide the respondents with a wide variety of choices, thereby enhancing the degree of measurement precision, detection of minor changes and providing more power to express a point of view. Respondents were asked to base their answer on current and future pharmacy practice needs rather than current practice needs only. They were also instructed to provide their reason for any disagreement responses to facilitate the discussion and clarification in the panel meeting. The experts were given two weeks to complete the survey so that results could be viewed and analysed ahead of the panel meeting. Figure 5.11 shows the timeline of the NGT rounds in this study.

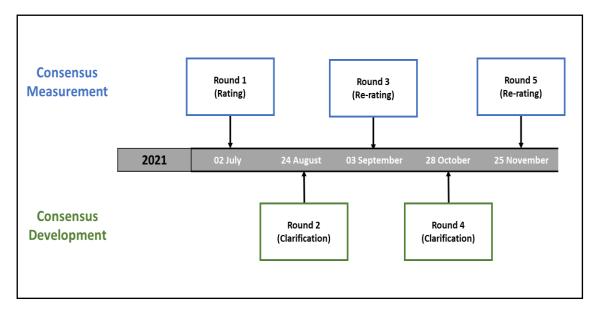


Figure 5.11: Timeline of NGT rounds in this study

The findings from the consensus measurement rounds (Rounds 1 and 3) were analysed and used to prepare a unique Personalised Panellist Rating Sheet (PPRS) (Fitch et al., 2001) for each expert as a basis for discussion in the following panel meeting rounds (Round 2 and 4, respectively). The PPRS enabled the experts to consider their initial ratings in relation to other panellists. Each PPRS involved a tabulated summary of the expert ranking of each behavioural statement plus the extent of agreement within the group members. The PPRS documents were fed back to the experts two days before the panel meeting.

5.6.4.2 Consensus development procedure

The purpose of the panel meeting was to enable panel members to clarify and explain their logic for their rating behavioural statements with the lowest agreement provided in the PPRS. This enabled the experts to discuss how their decisions about ranking were informed and provided them the opportunity to change their views through discussion with other experts.

Due to the social restrictions of COVID-19 pandemic as well as the diverse geographical locations of me, as the facilitator, and the experts at the time of the panel meetings, the panel meetings were conducted online using Microsoft Teams® video conferencing platform. The first meeting was structured as follows: I presented the introductory information about the project, previous phases of this research (phase 1 and phase 2a), the role and importance of competency frameworks in professional development, followed by an explanation of the expert panel discussion process. Then, the behavioural statements with the lowest agreement along with the median scores and interquartile ranges (IQR) were presented in a similar order to the PPRS for participants to clarify the logic behind the ranking for each statement. During the panel discussions, as the facilitator, my role was to present findings from the previous research phases, explain the discussion process, allow all statements with the lowest agreement sufficient time for discussion and ensure that all panellists had the opportunity to contribute and express their views. A maximum of five minutes per statement was allowed for comments and discussion. No ranking of the statements was permitted at the

meeting. Following the panel discussion, a revised list of the proposed framework was sent to the experts in the following day to re-rate their agreement with the revised framework. The second meeting was conducted two months after the first meeting (Figure 5.11) and followed a similar structure.

The panel discussion in the first meeting lasted two hours while the second lasted one hour. In both meetings, panel discussions were audio-recorded, with technical assistance and note taking provided by a non-participant observer.

5.6.5 Data analysis

Survey data were downloaded into SPSS version 27 for quantitative analysis using descriptive statistics. Consensus on either agreement or disagreement was defined a priori, as all ratings fell within any 3-point region in the 9-point Likert scale: the numerical value of 1 to 3 indicated disagreement, 4 to 6 indicated neither agreement nor disagreement, 7 to 9 indicated agreement. For each behavioural statements, the agreement about the appropriateness to be included in the proposed national competency framework was assessed along with the extent to which experts agreed or disagreed. The median score was calculated to indicate the group's overall agreement with the behavioural statements and the IQR to indicate the extent of consensus within the group. The level of agreement or disagreement was classified based on the dispersion of the individual ratings. The statement was deemed as having the disagreement if it had an overall median score of 6 or less, or a wide IQR of more than 3, or one rating or more in the 1-3 range. When the item fell into the disagreement criteria, the item was moved to the next round of panel discussion to discuss the amendment or removal from the framework. When the item fell into the agreement criteria, the item was considered appropriate for inclusion in the framework. With each consensus measurement round survey, the same a priori criteria for consensus were used.

5.6.6 Results

Five iterative rounds of consensus measurement (Rounds 1, 3 and 5) and development (Rounds 2 and 4) were conducted between July and November 2021. Of the 16 individuals invited to the panel, 9 experts participated with expertise in different pharmacy sectors in Saudi Arabia (Table 5.13). All participants were in middle or senior management positions (e.g. sector representative, pharmacy director, business owner), with some of them holding several positions, e.g. part-time academic and representative of pharmaceutical sector. Invitees who expressed interest but did not return responses to the panel included one from pharmaceutical industries in Round 3 and one from pharmaceutical marketing in Round 4.

Table 5.13: Demographic characteristics of the experts (n=9)

Characteristics		N
Gender	Male	8
	Female	1
Nationality	Saudi	8
	Non-Saudi	1
Age	< 40 years	1
	41-50 years	4
	> 51 years	4
Education	PharmD degree	2
	Master's degree	2
	PhD degree	5
Pharmacy sector	Community pharmacy	1
	Hospital	2
	Academia	1
	Pharmaceutical industry	1
	Pharmaceutical marketing	1
	Regulatory authorities	1
	Professional bodies	2
Years of experience	6 to 10 years	2
	11 to 20 years	4
	21 to 30 years	3

5.6.6.1 Round 1 (Rating stage: self-administered survey)

Out of the 126 behavioural statements, 107 met the predefined definition of consensus on appropriateness from the group in the first round. The median scores and IQR ratings for all 107 statements were within the 3-point region of the agreement category. This included all behaviours in PPH, 23 (82.1%) PC, 24 (72.7%) OM, 50 (90.9%) PP and new behaviours suggested from the previous phase of this research.

Of the 19 statements with the lowest agreement, behaviour 5.2 "compound under the good manufacturing practice for pharmaceutical (GMP) medicines" had a median of 6, behaviour 6.6 "implement and maintain a dispensing error reporting system and a 'near misses' reporting system" had a wide IQR of more than 3 while the remaining behaviours had at least one rating of disagreement (6.3, 9.3, 9.6, 10.1, 10.2, 10.3, 10.4, 10.5, 11.1, 13.3, 13.4, 13.8, 21.2, 21.5, 21.7, 23.2, 23.3). These 19 behaviours were mainly related to "compounding medicines", "dispensing", "patient consultation and diagnosis", "budget and reimbursement", "human resources management", "procurement", "legal and regulatory practice" and "quality assurance and research in workplace" competency groups (Table 5.14). As they fell into the disagreement criteria, these 19 behaviours were moved to the next round of panel discussion, i.e. Round 2, to discuss the amendment or removal of each behavioural statement from the framework.

Table 5.14: Respondents appropriateness ratings of behavioural statements- Round 1

Con	npetency group	The le	vel of experts' g	group agreement on the statement		
		appropriateness to the current and future needs of the				
		practice				
		Group's	Group's			
	Behavioural statement	Median	Interquartile	The consensus status		
			range (IQR)			
	Pharma	ceutical P	ublic Health Clus	ster (PPH)		
1.	Emergency response					
1.1	Participate in the response to	9	8-9	Agreement		
	lic health emergencies	J	8-3	Agreement		
1.2	Assist the multidisciplinary					
	healthcare teams in	9	8.50-9	Agreement		
	emergency situations					
2.	Health promotion					
2.1	Assess the					
	patient's/population's					
	primary healthcare needs	8	8-9	Agreement		
	(taking into account the		0.5	Abreement		
	cultural and social setting of					
	the patient/populations)					
2.2	Advise and provide services					
	related to health promotion;					
	disease prevention and	9	8-9	Agreement		
	control (e.g. vaccination); and					
	healthy lifestyle					
2.3	Identify and support national					
	and local health priorities and	8	7-9	Agreement		
	initiatives			95-14859		
3.	Medicines information and adv	rice				
3.1	Counsel the					
	patient/population on the					
	safe and rational use of					
	medicines and devices					
	(including the selection, use,	9	9-9	Agreement		
	contraindications, storage,		-73.1			
	and side effects of non-					
	prescription and prescription					
	medicines)					
3.2	Identify sources, retrieve,					
	evaluate, organise, assess and					
	provide relevant and	9	8.50-9	Agreement		
	appropriate medicines	9	6.30 -9	Agreement		
	information according to the					
i	needs of patients and clients					
3.3	Support the patient's use of					
	health information					
	technologies and digital	9	7-9	Agreement		
	communication (including IT					
	driven health solutions)					
	PI	narmaceuti	ical care cluster	(PC)		
4.	Assessment of medicines					
4.1	Gather, analyse, research, and	9		Agreement		
	interpret information about	17250	8-9	₩		
	the patient and patient's		2000			
	medicines-related needs (e.g.					

Con	npetency group			group agreement on the statement
1.22125.6		appro	priateness to t	he current and future needs of the
			Cuarrala	practice
	Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
	indication, effectiveness, safety and adherence)			
4.2	Retrieve relevant patient information (including drug history, or immunisation status for example) and record of allergies to medicines and Adverse Drug Reactions (ADR) in medication record	9	8-9	Agreement
4.3	Identify, prioritise, resolve and follow up on medicine-medicine interactions; medicine-disease interactions; medicine-patient interactions; medicines-food interactions	9	7-9	Agreement
100	Appropriately select medicines (e.g. according to the patient, hospital, government policy, etc.)	8	6-9	Agreement
5.	Compounding medicines			
5.1	Prepare pharmaceutical medicines (e.g. extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)	8	6.50-9	Agreement
5.2	Compound under the good manufacturing practice for pharmaceutical (GMP) medicines	6	4-9	The statement fell into the disagreement criteria: an overall median score of 6 or less.
6.	Dispensing			
6.1	Accurately dispense medicines for prescribed and/or minor ailments, including an embedded checking process	9	7.50-9	Agreement
6.2	Accurately report defective or substandard medicines to the appropriate authorities	8	7.50-9	Agreement
6.3	Appropriately validate prescriptions, ensuring that prescriptions are correctly interpreted and legal	9	7.50-9	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
6.4	Dispense devices (e.g. inhaler or a blood glucose meter)	8	7-9	Agreement

Competency group		The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice				
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status			
6.5 Document and act upon dispensing errors	9	8.50-9	Agreement			
6.6 Implement and maintain a dispensing error reporting system and a 'near misses' reporting system	8	5.50-9	The statement fell into the disagreement criteria: a wide IQR of more than 3			
6.7 Label the medicines (with the required and appropriate information)	9	8-9	Agreement			
6.8 Learn from and act upon previous 'near misses' and 'dispensing errors'	8	8-9	Agreement			
7. Medicines						
7.1 Advise patients on proper storage conditions of the medicines and ensure that medicines are stored appropriately (e.g. humidity, temperature, expiry date, etc.)	8	7.50-9	Agreement			
7.2 Appropriately select medicine formulation and concentration for minor ailments (e.g. diarrhoea, constipation, cough, hay fever, insect bites, etc.)	9	8-9	Agreement			
7.3 Ensure appropriate medicines, route, time, dose, documentation, action, form and response for individual patients	9	8-9	Agreement			
7.4 Package medicines to optimise safety (ensuring appropriate re-packaging and labelling of the medicines)	9	7.50-9	Agreement			
8. Monitor medicines therapy						
8.1 Apply guidelines, medicines formulary system, protocols and treatment pathways	9	8-9	Agreement			
8.2 Apply therapeutic medicines monitoring and assess impact and outcomes (including objective and subjective measures)	9	7-9	Agreement			
8.3 Identify, prioritise and resolve medicines management problems (including errors)	8	7.50-9	Agreement			

Competency group		group agreement on the statement he current and future needs of the	
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	practice The consensus status
9.1 Support urgent care needs (physical and mental) of patients and others and act upon arranging follow-up care	8	7.50-9	Agreement
9.2 Appropriately refer the patient or carer	8	6.50-8.50	Agreement
9.3 Assess and diagnose based on objective and subjective measures (where applicable)	8	5-9	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
9.4 Evaluate, assess, and develop health literacy education and counselling on medicines and healthcare needs	8	7-9	Agreement
9.5 Discuss and agree with the patients on the appropriate use of medicines, taking into account patients' preferences	9	7.50-9	Agreement
9.6 Document any intervention (e.g. document allergies, such as from medicines and nutrition in patient's medicines history)	8	6-9	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
9.7 Obtain, reconcile, review, maintain and update relevant patient medication and diseases history	8	7-9	Agreement
	ation and ſ	Vanagement cl	uster (OM)
10. Budget and reimbursement			
10.1Acknowledge the workplace organisational structure	8	7-9	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
10.2 Effectively set and apply budgets	7	5.50-8	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
10.3Manage appropriate claims for reimbursements	8	5.50-8.50	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
10.4Ensure financial transparency	8	6-8	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
10.5Ensure proper reference sources for service reimbursement	7	5.50-8.50	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
11. Human resources management			
11.1 Demonstrate organisational and management skills (e.g. plan, organise and lead on medicines management; risk management; self-management; time management; people	8	5-9	The statement fell into the disagreement criteria: one rating or more in the 1-3 range

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice		
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
management; project management; policy management)			
11.2 Identify and manage human resources and staffing issues	8	7.50-8.50	Agreement
11.3 Recognise and manage the potential of each staff member and utilise systems for performance management (e.g. conduct staff appraisals)	8	6.50-8.50	Agreement
11.4 Recognise the value of the pharmacy team and of a multidisciplinary team	9	8.50-9	Agreement
11.5 Support and facilitate staff training and continuing professional development	9	8-9	Agreement
12. Improvement of service			
12.1 Ildentify, implement and monitor new services (according to local needs)	8	8-8	Agreement
112.2 Resolve, follow up and prevent medicines related problems	9	8-9	Agreement
13. Procurement			
13.1 1Access reliable information and ensure the most cost-effective medicines in the right quantities with the appropriate quality	8	7-8.50	Agreement
13.2 Develop and implement contingency plan for shortages	9	8-9	Agreement
13.3 Efficiently link procurement to formulary, to push/pull system (supply chain management) and payment mechanisms	8	8-8.50	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
13.4 Ensure there is no conflict of interest	9	5.50-9	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
13.5 Identify and select reliable supplier(s)	8	8-9	Agreement
13.6 Select reliable supply of high- quality products (including appropriate selection and procurement processes, cost effectiveness, timely delivery)	8	7.50-9	Agreement
13.7 Supervise procurement activities	8	7-9	Agreement

Competency group			group agreement on the statement he current and future needs of the practice
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
13.8 Understand the tendering methods and evaluation of tender bids	7	5.50-8.50	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
14. Supply chain and management			
14.1 Demonstrate knowledge in store medicines to minimise errors and maximise accuracy	8	7-9	Agreement
14.2 Verify the accuracy of rolling stocks	8	6-8.50	Agreement
14.3 Ensure effective stock management and running of service with the dispensary	8	7-9	Agreement
14.4 Ensure logistics of delivery and storage	8	6.50-9	Agreement
14.5 Implement a system for documentation and record keeping	8	7-9	Agreement
14.6 Take responsibility for quantification and supply chain forecasting	8	6.50-9	Agreement
14.7 Mitigate risk of medicines shortages and stock outs through liaison and appropriate communication with healthcare staff, healthcare stakeholders, clients/customers and patients	8	8-9	Agreement
15. Workplace management 15.1 Address and manage day to			
day management issues 15.2 Demonstrate the ability to	8	6-9	Agreement
take accurate and timely decisions and make appropriate judgements	8	6-8.50	Agreement
15.3 1Ensure the production schedules are appropriately planned and managed	8	6-8.50	Agreement
115.4 Ensure the work time is appropriately planned and managed	8	7-8.50	Agreement
15.5 1Improve and manage the provision of pharmaceutical services	8	8-9	Agreement
15.6 Recognise and manage pharmacy resources (e.g. financial, infrastructure)	8	8-9	Agreement
Pro	ofessional/	Personal cluste	r (PP)
16. Communication skills			
16.1Communicate clearly, precisely and appropriately while being a mentor or tutor	9	8-9	Agreement

Competency group	The level of experts' group agreement on the statement		
	appropriateness to the current and future needs of the		
	practice		
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
16.2Communicate effectively with health and social care staff, support staff, patients, carer, family relatives and clients/customers, using lay terms and checking understanding	8	8-9	Agreement
16.3 Tailor communication that is appropriate to the patient's needs (including health literacy, cultural or language barriers, social needs, and emotional status)	8	8-9	Agreement
16.4Use appropriate communication skills (e.g. verbal and non-verbal) to establish and maintain rapport with the patient and others including when communicating through digital and electronic platforms	8	8-9	Agreement
16.5Use appropriate communication skills (e.g. verbal and non-verbal) to establish and maintain rapport with the patient and others including when communicating through digital and electronic platforms	8	8-9	Agreement
17. Continuing professional develo	pment (CP	D)	
17.1Document CPD activities	8	8-9	Agreement
17.2Engage with students/interns/residents	8	8-9	Agreement
17.3Evaluate accuracy of knowledge and skills	8	6.50-9	Agreement
17.4Identify learning and development needs	8	7-9	Agreement
17.5Evaluate learning and development progress	8	7.50-8.50	Agreement
17.6Identify if expertise is needed outside current scope of knowledge	7	6-8	Agreement
17.7Recognise own limitations and act upon them	8	7.50-8.50	Agreement
17.8Reflect on performance	8	8-8.50	Agreement
17.9Demonstrate engagement/participation in professional development and	8	7-8.50	Agreement

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice		
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
lifelong learning activities			
18. Digital literacy		· · · · · · · · · · · · · · · · · · ·	
18.1Identify, manage, organise, store, and share digital information	8	8-9	Agreement
18.2Critically appraise, analyse, evaluate, and/or interpret digital information and their sources	8	8-9	Agreement
18.3 Where applicable, participate in digital health services that promote health outcomes and engage with digital technologies (e.g. social media platforms & mobile applications) to facilitate discussions with the patient and others	9	8-9	Agreement
18.4Maintain patient privacy and security of digital information related to the patient and workplace	9	9-9	Agreement
19. Interprofessional collaboration			
19.1Respect and acknowledge the expertise, roles and responsibilities of colleagues and other health professionals	9	8-9	Agreement
19.2Participate, collaborate, advise in therapeutic decision- making, and use appropriate referral in a multi-disciplinary team	9	8-9	Agreement
19.3Engage in collaborative practice, research and service provision to optimise patient health outcomes	8	8-8.50	Agreement
19.4Engage in relationship- building with health professionals allowing conflict resolution, teamwork, communication, and consultation	8	8-9	Agreement
19.5Demonstrate mutual respect and adopt shared values of the workplace and toward patient care	9	8-9	Agreement
20. Leadership and self-regulation		•	
20.1Apply assertiveness skills	8	6.50-8.75	Agreement
(inspire confidence) 20.2Demonstrate leadership and			

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice		
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
practice management skills, initiative and efficiency			
20.3Document risk management (critical incidents)	8	7.50-8.50	Agreement
20.4Prioritise work, practice punctuality and time management	8	8-9	Agreement
20.5 Develop, implement and monitor innovative ideas	8	7-9	Agreement
20.6Recognise and describe emotional information about self and others (e.g. self- awareness, self-regulation, motivation, social skills and empathy)	8	7-8.50	Agreement
20.7Demonstrate flexibility and adaptability to a variety of conditions and circumstances	8	7-8.50	Agreement
20.8Recognise when affected by setbacks or stress and manage with effective coping strategies (resilience)	8	6-8.50	Agreement
21 Legal and regulatory practice		5	
21.1Apply regulatory affairs and the key aspects of pharmaceutical registration and legislation	9	8-9	Agreement
21.2Apply the principals of business economics and intellectual property rights including the basics of patent interpretation	8	5.50-8	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
21.3Be aware of and identify the new medicines coming to the market	8	6.50-9	Agreement
21.4Comply with legislation for drugs with the potential for abuse	9	8.25-9	Agreement
21.5Apply the principles of marketing and sales	8	5-8.50	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
21.6Engage with health and medicines policies	8	7.50-9	Agreement
21.7Recognise the steps needed to bring a medical device or medicine to the market including the safety, quality, efficacy and pharmacoeconomic assessments of the product	8	6-8.50	The statement fell into the disagreement criteria: one rating or more in the 1-3 range

Competency group	The level of experts' group agreement on the sta appropriateness to the current and future need practice		
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
22 Professional and ethical practic	e		
22.1Demonstrate awareness and employment of local/national codes of ethics	9	8-9	Agreement
22.2Fulfil duty of care to the patient and the public	9	8-9	Agreement
22.3Maintain privacy and confidentiality (with the patient and other healthcare professionals)	9	8.50-9	Agreement
22.4Comply with patient privacy legislation including documentation of information	9	8.50-9	Agreement
22.5Consider available evidence and support the patient to make informed choices about medicine use	8	8-9	Agreement
22.6Obtain patient consent (it can be implicit on occasion)	8	8-9	Agreement
22.7Recognise professional limitations of self and others in the team	8	7.50-9	Agreement
22.8Demonstrate professional responsibility for all decisions made and actions taken	9	8-9	Agreement
22.9Demonstrate awareness of socially accountable practice (including cultural and social needs; cultural safety, respect, and responsiveness; diversity, equity and inclusiveness)	8	7-8.50	Agreement
23 Quality assurance and research	in the wo	rkplace	
23.1 Apply research findings and understand risk-benefit analyses (e.g. pre-clinical, clinical trials, experimental clinical pharmacological research, and risk management)	8	6.50-8	Agreement
23.2Audit quality of service (meet local and national standards and specifications)	8	7-8	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
23.3 Develop and implement Standing Operating Procedures (SOP's)	7	7-9	The statement fell into the disagreement criteria: one rating or more in the 1-3 range
23.4Ensure appropriate quality control tests are performed and managed appropriately	7	6-8	Agreement
23.5Ensure medicines are not counterfeit and adhere to quality standards	9	9-9	Agreement

Competend	cy group	The level of experts' group agreement on the stateme appropriateness to the current and future needs of the practice		
В	Sehavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
eviden	y and evaluate ce-base to improve the medicines and services	9	8-9	Agreement
23.7Identify, investigate, conduct, supervise and support research at the workplace (enquiry-driven practice)		8	7-8.50	Agreement
23.8Implement, conduct and maintain a reporting system of pharmacovigilance (e.g. report Adverse Drug Reactions)		9	8-9	Agreement
Account to the second	23.9Initiate and implement audit research activities		5-8	Agreement
		New sugg	ested behaviou	rs
pharma	e point of care testing in acy for patients and unity members (e.g. BP,	8	8-9	Agreement
patient generic medicir	and agree with the s about the appropriate s substitution of nes according to s' preference and / or	8	7-9	Agreement

5.6.6.2 Round 2 (Clarification stage-the panel meeting)

At the first meeting (Round 2), the 9 experts discussed the 19 behaviours with the lowest agreement from Round 1 (Table 5.15) and agreed to change the wording of nine behavioural statements to make them more relevant to Saudi pharmacy practice (Table 5.16).

Table 5.15: List of the 19 behavioural statements with lowest agreement on appropriateness from Round 1

Competency	Behavioural statement				
group					
Custer 2: Pharmaceutical care (PC) competencies					
5. Compounding medicines	5.2 Compound under the good manufacturing practice for pharmaceutical (GMP) medicines				
6.Dispensing	6.3 Appropriately validate prescriptions, ensuring that prescriptions are				
6.Disperising	correctly interpreted and legal				
	6.6 Implement and maintain a dispensing error reporting system and a 'near misses' reporting system				
9. Patient consultation and	9.3 Assess and diagnose based on objective and subjective measures (where applicable)				
diagnosis	9.6 Document any intervention (e.g. document allergies, such as from medicines and nutrition in patient's medicines history)				
Cluster 3: Organisat	tion and Management (OM) competencies				
10. Budget and	10.1 Acknowledge the workplace organisational structure				
reimbursement	10.2 Effectively set and apply budgets				
	10.3 Manage appropriate claims for reimbursements				
	10.4 Ensure financial transparency				
	10.5 Ensure proper reference sources for service reimbursement				
11. Human	11.1 Demonstrate organisational and management skills (e.g. plan, organise				
resources and	and lead on medicines management; risk management; self-management;				
management	time management; people management; project management; policy management)				
13. Procurement	13.3 Efficiently link procurement to formulary, to push/pull system (supply				
	chain management) and payment mechanisms				
	13.4 Ensure there is no conflict of interest				
	13.8 Understand the tendering methods and evaluation of tender bids				
Cluster 4: Professio	nal/ Personal (PP) competencies				
21.Legal and	21.2 Apply the principals of business economics and intellectual property				
regulatory	rights including the basics of patent interpretation				
practice	21.5 Apply the principles of marketing and sales				
	21.7 Recognise the steps needed to bring a medical device or medicine to				
	the market including the safety, quality, efficacy and pharmacoeconomic				
	assessments of the product				
19. Quality	23.2 Audit quality of service (meet local and national standards and				
assurance and	specifications)				
research in the	23.3 Develop and implement Standing Operating Procedures (SOP's)				
workplace					

This included behaviours (6.6, 9.3) in the PC, (10.2, 10.3, 13.3, 13.4, 13.8) in the OM and (21.5, 21.7) in the PP. It was agreed to keep the remaining 10 behaviours with no amendments. One of the significant amendments to the framework was to add the new suggested behaviours from the previous research phase to the adapted framework. The new behaviours "provide point of care testing for patients and communities (e.g. BS, BP, INR)" and "discuss and agree with the patients about the appropriate generic substitution of medicines according to patients' preference and / or budget" were included in the "assessment of medicines" competency group under the PC cluster. In addition, experts agreed to amend the new behaviour "discuss and agree with the patients about the appropriate generic substitution of medicines according to patients' preference and / or budget" to "discuss the appropriate generic substitution of medicines according to patients' preference (where applicable)".

Table 5.16: List of the FIP GbCF v2 original behavioural statements and the amended behavioural statements generated from the consensus development Round 2

Competency group	FIP GbCF v2 behavioural statement	The amended behavioural statements				
<u> </u>	Custer 2: Pharmaceutical care (PC) competencies					
6.Dispensing	6.6 Implement and maintain a dispensing error reporting system and a 'near misses' reporting system	6.6 Identify and report ALL medication errors (including dispensing errors) and near misses following relevant medication error reporting systems				
9. Patient consultation and diagnosis	9.3 Assess and diagnose based on objective and subjective measures (where applicable)	9.3 Assess and support individual self- care needs based on objective and subjective measures (where applicable) and participate in differential diagnosis for minor illnesses				
Cluster 3: Organi	sation and Management (OM) compete	ncies				
10. Budget and reimbursement	10.2 Effectively set and apply budgets	10.2 Participate in setting and applying budgets				
	10.3 Manage appropriate claims for reimbursements	10.3 Manage appropriate claims for reimbursements (including those from governmental agencies or private entities)				
	10.4 Ensure financial transparency	10.4 Ensure financial transparency by providing a complete, timely and accurate financial information relevant to area of practice				
13. Procurement	13.3 Efficiently link procurement to formulary, to push/pull system (supply chain management) and payment mechanisms	13.3 Efficiently link procurement to formulary or drug lists, to push/pull system (supply chain management) and payment mechanisms				

Competency group	FIP GbCF v2 behavioural statement	The amended behavioural statements
8. oup	13.4 Ensure there is no conflict of interest	13.4 Avoid and declare personal or professional conflict of interests, if and where they arise
Cluster 4: Profes	13.8 Understand the tendering methods and evaluation of tender bids sional/ Personal (PP) competencies	13.8 Understand the procurement methods and evaluation of tender bids
21.Legal and regulatory	21.5 Apply the principles of marketing and sales	21.5 Engage in appropriate marketing and sales
practice	21.7 Recognise the steps needed to bring a medical device or medicine to the market including the safety, quality, efficacy and pharmacoeconomic assessments of the product	21.7 Recognise the steps needed to bring a medicine to the market including the safety, quality, efficacy and pharmacoeconomic assessments of the product

Thereafter, a revised draft of the competency framework was sent to the experts by email to re-rank (in Round 3) the appropriateness of the 126 behavioural statements to the Saudi pharmacy practice environment in light of the Round 2 discussion.

5.6.6.3 Round 3 (Re-rating stage: self-administered survey)

The re-rating of the revised draft competency framework in Round 3 showed an increased agreement on the appropriateness for inclusion compared to Round 1 (Table 5.17). An increased agreement on appropriateness was observed in PC, OM and PP clusters from 82.2%, 72.7% and 90.9%, respectively in Round 1 to 100%, 87.9%% and 100%, respectively in Round 3, whereas, there was decreased agreement on appropriateness from 100% in Round 1 to 87.5% in Round 3 for the PPH cluster. The behaviours with the lowest agreement on appropriateness in this round were from the OM cluster, namely, "budget and reimbursement", "human resources and management" and "procurement" competency groups. Of the five behaviours with the lowest agreement in Round 3, behaviours 10.4 "ensure financial transparency", 11.1 "demonstrate organisational and management skills (e.g. plan, organise and lead on medicines management; risk management; selfmanagement; time management; people management; project management; policy management" and 11.2 "identify and manage human resources and staffing issues" showed a wide IQR and behaviour 3.3 "support the patient's use of health information technologies and digital communication (including IT driven health solutions)" showed a response of disagreement. Behaviour 13.8 "understand the tendering methods and evaluation of tender bids" remained a behaviour of disagreement in Round 3. As they fell into the disagreement criteria, these five behaviours were moved to the next round of panel discussion, i.e. Round 4, to discuss the amendment or removal of each behavioural statement from the framework.

Table 5.17: Respondents appropriateness ratings of behavioural statements- Round 3

Competency group			group agreement on the statement	
	appropriateness to the current and future needs of the			
			practice	
	Group's	Group's	200	
Behavioural statement	Median	Interquartile	The consensus status	
		range (IQR)		
	aceutical P	ublic Health Clu	ster (PPH)	
1. Emergency response	_		•	
1.1 Participate in the response to	9	9-9	Agreement	
public health emergencies	120		4	
1.2 Assist the multidisciplinary	9	9-9	Agreement	
healthcare teams in				
emergency situations				
2. Health promotion		1 22		
1.1 Assess the	8.50	8-9	Agreement	
patient's/population's				
primary healthcare needs				
(taking into account the				
cultural and social setting of				
the patient/populations)	1400	6002 aware (200	1000	
1.2 Advise and provide services	9	8.25-9	Agreement	
related to health promotion;				
disease prevention and				
control (e.g. vaccination); and				
healthy lifestyle				
1.3 Identify and support national	9	9-9	Agreement	
and local health priorities and				
initiatives				
3. Medicines information and ad	and the second second	1		
3.1 Counsel the	9	9-9	Agreement	
patient/population on the				
safe and rational use of				
medicines and devices				
(including the selection, use,				
contraindications, storage,				
and side effects of non-				
prescription and prescription				
medicines)			•	
3.2 Identify sources, retrieve,	9		Agreement	
evaluate, organise, assess and		9-9		
provide relevant and				
appropriate medicines				
information according to the				
needs of patients and clients		0.0	The obstance of U.S. of	
3.3 Support the patient's use of	9	8-9	The statement fell into the	
health information			disagreement criteria: one rating o	
technologies and digital			more in the 1-3 range	
communication (including IT				
driven health solutions)	have a t	ical care alres	(DC)	
	narmaceut	ical care cluster	(PC)	
4 Assessment of medicines	1 ^	1	A	
4.1 Gather, analyse, research, and	9	0.25.0	Agreement	
interpret information about		8.25-9		
the patient and patient's		_		

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice		
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
medicines-related needs (e.g. indication, effectiveness, safety and adherence)			
4.2 Retrieve relevant patient information (including drug history, or immunisation status for example) and record of allergies to medicines and Adverse Drug Reactions (ADR) in medication record	9	8.25-9	Agreement
4.3 Identify, prioritise, resolve and follow up on medicine-medicine interactions; medicine-disease interactions; medicine-patient interactions; medicines-food interactions		9-9	Agreement
4.4 Appropriately select medicines (e.g. according to the patient, hospital, government policy, etc.)	9	8-9	Agreement
4.5 Provide point of care testing for patients and communities (e.g. BS, BP, INR)	9	8-9	Agreement
4.6 Discuss the appropriate generic substitution of medicines according to patients' preference (where applicable)	8.50	8-9	Agreement
5.1 Prepare pharmaceutical medicines (e.g. extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)	9	8.25-9	Agreement
5.2 Compound under the good manufacturing practice for pharmaceutical (GMP) medicines	8.50	6.50-9	Agreement
6.1 Accurately dispense medicines for prescribed and/or minor ailments, including an embedded checking process	9	8.25-9	Agreement

Competer	ncy group			roup agreement on the statement	
		appropriateness to the current and future needs of the practice			
			Group's	practice	
	Behavioural statement	Group's Median	Interquartile range (IQR)	The consensus status	
substa appro	ately report defective or andard medicines to the priate authorities	9	8-9	Agreement	
presci presci	opriately validate riptions, ensuring that riptions are correctly preted and legal	9	9-9	Agreement	
6.4 Dispe	nse devices (e.g. inhaler lood glucose meter)	9	8-9	Agreement	
	ment and act upon nsing errors	9	9-9	Agreement	
disper syster	ment and maintain a nsing error reporting n and a 'near misses' ting system	9	8.25-9	Agreement	
6.7 Label requi	the medicines (with the red and appropriate nation)	9	9-9	Agreement	
6.8 Learn previo	from and act upon ous 'near misses' and ensing errors'	9	9-9	Agreement	
7 Medi	cines	on =3			
storag medio medio appro	e patients on proper ge conditions of the sines and ensure that sines are stored priately (e.g. humidity, erature, expiry date,	9	9-9	Agreement	
7.2 Appro formu conce ailme consti	opriately select medicine ulation and entration for minor nts (e.g. diarrhoea, ipation, cough, hay fever, bites, etc.)	9	8.25-9	Agreement	
medio docur	e appropriate sines, route, time, dose, mentation, action, form esponse for individual nts	9	9-9	Agreement	
optim appro	ge medicines to lise safety (ensuring priate re-packaging and ing of the medicines)	9	8.25-9	Agreement	
	tor medicines therapy	8			
formu	guidelines, medicines ılary system, protocols reatment pathways	9	9-9	Agreement	

Competency group				group agreement on the statement he current and future needs of the	
		practice			
	Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status	
8.2	Apply therapeutic medicines monitoring and assess impact and outcomes (including objective and subjective measures)	9	8.25-9	Agreement	
8.3	Identify, prioritise and resolve medicines management problems (including errors)	9	8.25-9	Agreement	
9	Patient consultation and diagn	osis compe	tency group		
9.1	Support urgent care needs (physical and mental) of patients and others and act upon arranging follow-up care	9	8-9	Agreement	
9.2	Appropriately refer the patient or carer	8	7.25-9	Agreement	
9.3	Assess and diagnose based on objective and subjective measures (where applicable)	8.50	7.25-9	Agreement	
9.4	Evaluate, assess, and develop health literacy education and counselling on medicines and healthcare needs	9	8-9	Agreement	
9.5	Discuss and agree with the patients on the appropriate use of medicines, taking into account patients' preferences	9	8.25-9	Agreement	
9.6	Document any intervention (e.g. document allergies, such as from medicines and nutrition in patient's medicines history)	9	8.25-9	Agreement	
9.7	Obtain, reconcile, review, maintain and update relevant patient medication and diseases history	9	9-9	Agreement	
4 -		ation and I	Management cl	uster (OM)	
10	Budget and reimbursement		7.05.0	Ι	
	Acknowledge the workplace organisational structure	9	7.25-9	Agreement	
10.2	2 Effectively set and apply budgets	7.50	6.25-8	Agreement	
10.3	BManage appropriate claims for reimbursements	8.50	6-9	Agreement	
10.4	Ensure financial transparency	8	5.25-9	The statement fell into the disagreement criteria: a wide IQR of more than 3	

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the			
	practice			
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status	
10.5Ensure proper reference sources for service reimbursement	8	6.25-8.75	Agreement	
1, 211110, 211 2 2111 2112				
11 Human resources management 11.1 Demonstrate organisational and management skills (e.g. plan, organise and lead on medicines management; risk management; self-management; time management; people management; project	8.50	5.75-9	The statement fell into the disagreement criteria: a wide IQR of more than 3	
management; policy				
management) 11.2 Identify and manage human resources and staffing issues	8	5.75-9	The statement fell into the disagreement criteria: a wide IQR of more than 3	
11.3 Recognise and manage the potential of each staff member and utilise systems for performance management (e.g. conduct staff appraisals)	9	7.25-9	Agreement	
11.4 Recognise the value of the pharmacy team and of a multidisciplinary team	9	9 -9	Agreement	
11.5 Support and facilitate staff training and continuing professional development	9	8-9	Agreement	
12 Improvement of service				
12.1 Ildentify, implement and monitor new services (according to local needs)	8.50	7.25-9	Agreement	
112.2 Resolve, follow up and prevent medicines related problems	9	9-9	Agreement	
13 Procurement	_			
13.1 1Access reliable information and ensure the most cost-effective medicines in the right quantities with the appropriate quality	9	8-9	Agreement	
13.2 Develop and implement contingency plan for shortages	9	8-9	Agreement	
13.3 Efficiently link procurement to formulary, to push/pull system (supply chain management) and payment mechanisms	8	8-9	Agreement	
13.4 Ensure there is no conflict of interest	8	8-9	Agreement	

Competency group			group agreement on the statement he current and future needs of the	
	practice			
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status	
13.5 Identify and select reliable supplier(s)	9	8-9	Agreement	
13.6 Select reliable supply of high- quality products (including appropriate selection and procurement processes, cost effectiveness, timely delivery)	8.5	7.25-9	Agreement	
13.7 Supervise procurement activities	8	7.25-9	Agreement	
13.8 Understand the tendering methods and evaluation of tender bids	8	6.25-8.75	The statement fell into the disagreement criteria: one rating or more in the 1-3 range	
14 Supply chain and management				
14.1 Demonstrate knowledge in store medicines to minimise errors and maximise accuracy	8.5	7.25-9	Agreement	
14.2 Verify the accuracy of rolling stocks	9	6.25-9	Agreement	
14.3 Ensure effective stock management and running of service with the dispensary	9	6.50-9	Agreement	
14.4 Ensure logistics of delivery and storage	8.50	6.50-9	Agreement	
14.5 Implement a system for documentation and record keeping	9	8-9	Agreement	
14.6 Take responsibility for quantification and supply chain forecasting	9	7.25-9	Agreement	
14.7 Mitigate risk of medicines shortages and stock outs through liaison and appropriate communication with healthcare staff, healthcare stakeholders, clients/customers and patients	9	8-9	Agreement	
15 Workplace management 15.1 Address and manage day to day management issues	9	7.25-9	Agreement	
15.2 Demonstrate the ability to take accurate and timely decisions and make appropriate judgements	9	7.25-9	Agreement	
15.3 1Ensure the production schedules are appropriately planned and managed	8.5	7.25-9	Agreement	
115.4 Ensure the work time is appropriately planned and managed	9	8-9	Agreement	
15.5 Ilmprove and manage the provision of pharmaceutical services	9	8.25-9	Agreement	

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice			
Behavioural statement	Group's	Group's Interquartile	The consensus status	
	Median	range (IQR)		
15.6 Recognise and manage	8.50	8-9		
pharmacy resources (e.g. financial,			Agreement	
infrastructure)				
Pre	ofessional/	Personal cluster	r (PP)	
16 Communication skills				
16.1Communicate clearly,	9	8.25-9		
precisely and appropriately			Agreement	
while being a mentor or tutor			10 / 2000 10 feet 10 f	
16.2Communicate effectively with	9	9-9		
health and social care staff,				
support staff, patients, carer,				
family relatives and			Agreement	
clients/customers, using lay				
terms and checking				
understanding				
16.3 Tailor communication that is	9	9-9		
appropriate to the patient's				
needs (including health			Agreement	
literacy, cultural or language			Agreement	
barriers, social needs, and				
emotional status)				
16.4Use appropriate	9	9-9		
communication skills (e.g.				
verbal and non-verbal) to				
establish and maintain				
rapport with the patient and			Agreement	
others including when				
communicating through				
digital and electronic				
platforms	_			
16.5Use appropriate	9	8.25-9		
communication skills (e.g.				
verbal and non-verbal) to				
establish and maintain			A t	
rapport with the patient and			Agreement	
others including when				
communicating through				
digital and electronic				
platforms 17 Continuing professional develo	nmant (CD	D)		
AND THE RESERVE OF THE SECOND			16	
17.1Document CPD activities	9	8-9	Agreement	
17.2Engage with	9	8.25-9	Agreement	
students/interns/residents		SQ 531 FF	.0	
17.3Evaluate accuracy of	9	8.25-9	Agreement	
knowledge and skills	good	6025 NW	:O:=····	
17.4Identify learning and	9	8-9	Agreement	
development needs	o o	0-1		
17.5Evaluate learning and	9	8-9	Agreement	
development progress				

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the			
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status	
17.6Identify if expertise is needed outside current scope of knowledge	8	7.25-9	Agreement	
17.7Recognise own limitations and act upon them	9	8-9	Agreement	
17.8Reflect on performance	8.5	8-9	Agreement	
17.9Demonstrate engagement/participation in professional development and lifelong learning activities	8.5	8-9	Agreement	
18 Digital literacy	120	T === T		
18.1Identify, manage, organise, store, and share digital information	9	7.5-9	Agreement	
18.2Critically appraise, analyse, evaluate, and/or interpret digital information and their sources	8.5	8-9	Agreement	
18.3 Where applicable, participate in digital health services that promote health outcomes and engage with digital technologies (e.g. social media platforms & mobile applications) to facilitate discussions with the patient and others	8.5	8-9	Agreement	
18.4Maintain patient privacy and security of digital information related to the patient and workplace	9	9-9	Agreement	
19 Interprofessional collaboration		2		
19.1Respect and acknowledge the expertise, roles and responsibilities of colleagues and other health professionals	9	8.25-9	Agreement	
19.2Participate, collaborate, advise in therapeutic decision- making, and use appropriate referral in a multi-disciplinary team	9	8.25-9	Agreement	
19.3Engage in collaborative practice, research and service provision to optimise patient health outcomes	8.5	8-9	Agreement	
19.4Engage in relationship- building with health professionals allowing conflict resolution, teamwork, communication, and	9	8-9	Agreement	

Competency group	CONTRACTOR AND CONTRACTOR	priateness to the c	up agreement on the statement current and future needs of the practice
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
consultation			
19.5Demonstrate mutual respect	9	9-9	
and adopt shared values of			Agroomont
the workplace and toward			Agreement
patient care			
20 Leadership and self-regulation			
20.1Apply assertiveness skills (inspire confidence)	8.5	8-9	Agreement
20.2Demonstrate leadership and	8.5	8-9	
practice management skills,	o mod CPDs	a market	Agreement
initiative and efficiency			_
20.3Document risk management	9	8-9	
(critical incidents)			Agreement
20.4Prioritise work, practice	9	8.25-9	
punctuality and time			Agreement
management			C
20.5 Develop, implement and	9	8-9	1000er
monitor innovative ideas	14-40		Agreement
20.6Recognise and describe	8	8-9	
emotional information about	100	1970 1970	
self and others (e.g. self-			244E 1982
awareness, self-regulation,			Agreement
motivation, social skills and			
empathy)			
20.7Demonstrate flexibility and	9	8-9	
adaptability to a variety of			Agreement
conditions and circumstances			3
20.8Recognise when affected by	9	8-9	
setbacks or stress and manage			75
with effective coping			Agreement
strategies (resilience)			
21 Legal and regulatory practice			
21.1Apply regulatory affairs and	9	8.25-9	
the key aspects of		5.25 5	
pharmaceutical registration			Agreement
and legislation			
21.2Apply the principals of	9	8-9	
business economics and			
intellectual property rights			Agreement
including the basics of patent			, Si comont
interpretation			
21.3Be aware of and identify the	8	8-9	
new medicines coming to the			Agreement
market			7.6. centeric
21.4Comply with legislation for	9	9-9	
drugs with the potential for			Agreement
abuse			Agreement
- 1 / 10 / 10 / 10 / 10 / 10 / 10 / 10 /	10206	19201928	
21.5Apply the principles of	8	7-9	

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the			
	practice			
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status	
21.6Engage with health and medicines policies	9	8.25-9	Agreement	
21.7Recognise the steps needed to bring a medical device or medicine to the market including the safety, quality, efficacy and pharmacoeconomic assessments of the product	8.5	6.5-9	Agreement	
22 Professional and ethical practic	e			
22.1Demonstrate awareness and employment of local/national codes of ethics	9	8.25-9	Agreement	
22.2Fulfil duty of care to the patient and the public	9	9-9	Agreement	
22.3Maintain privacy and confidentiality (with the patient and other healthcare professionals)	9	9-9	Agreement	
22.4Comply with patient privacy legislation including documentation of information	9	8.25-9	Agreement	
22.5Consider available evidence and support the patient to make informed choices about medicine use	9	8.25-9	Agreement	
22.6Obtain patient consent (it can be implicit on occasion)	9	7.25-9	Agreement	
22.7Recognise professional limitations of self and others in the team	9	9-9	Agreement	
22.8Demonstrate professional responsibility for all decisions made and actions taken	9	9-9	Agreement	
22.9Demonstrate awareness of socially accountable practice (including cultural and social needs; cultural safety, respect, and responsiveness; diversity, equity and inclusiveness)	8.5	8-9	Agreement	
23 Quality assurance and research	in the wo	rkplace		
23.1 Apply research findings and understand risk-benefit analyses (e.g. pre-clinical, clinical trials, experimental clinical pharmacological research, and risk management)	8.5	7.25-9	Agreement	
23.2Audit quality of service (meet local and national standards and specifications)	8.5	8-9	Agreement	

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice			
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status	
23.3 Develop and implement Standing Operating Procedures (SOP's)	9	7.25-9	Agreement	
23.4 Ensure appropriate quality control tests are performed and managed appropriately	8	6.25-9	Agreement	
23.5Ensure medicines are not counterfeit and adhere to quality standards	9	7.25-9	Agreement	
23.6 Identify and evaluate evidence-base to improve the use of medicines and services	9	8-9	Agreement	
23.6Identify, investigate, conduct, supervise and support research at the workplace (enquiry-driven practice)	8	7.25-9	Agreement	
23.7Implement, conduct and maintain a reporting system of pharmacovigilance (e.g. report Adverse Drug Reactions)	9	8.25-9	Agreement	
23.8Initiate and implement audit research activities	8.5	7-9	Agreement	

5.6.6.4 Round 4 (Clarification stage: the panel meeting)

In the second meeting (Round 4), the seven experts discussed the five behaviours with the lowest agreement from Round 3 (Table 5.18) and agreed on further amendments.

Table 5.18: List of the five behavioural statements with lowest agreement on appropriateness from Round 3

Competency	Behavioural statement					
group						
Custer 2: Pharmace	Custer 2: Pharmaceutical care (PC) competencies					
3. Medicines information and advice	3.3 Support the patient's use of health information technologies and digital communication (including IT driven health solutions)					
Cluster 3: Organisation and Management (OM) competencies						
10. Budget and reimbursement	10.4 Ensure financial transparency					
11. Human resources and management	11.1 Demonstrate organisational and management skills (e.g. plan, organise and lead on medicines management; risk management; self-management; time management; people management; project management; policy management) 11.2 Identify and manage human resources and staffing issues					
13. Procurement	13.8 Understand the tendering methods and evaluation of tender bids					

This encompassed adding a definition to clarify behaviour 10.4 from "ensure financial transparency" to "ensure financial transparency by providing a complete, timely and accurate financial information relevant to area of practice". Behaviour 11.2 "identify and manage human resources and staffing issues" was agreed by the majority of the group on its appropriateness for inclusion, whereas behaviour 13.8 "understand the tendering methods and evaluation of tender bids" was considered for exclusion for being too advanced for foundation level practitioners as it is often conducted by senior pharmacists and high-level managers. Thereafter, a revised draft of the competency framework was sent to the experts by email to re-rank (Round 5) the appropriateness of the 126 behavioural statements to the Saudi pharmacy practice environment in light of the Round 4 discussion.

5.6.6.5 Round 5 (Re-rating stage: self-administered survey)

The re-rating of the revised draft competency framework in Round 5 showed an increased agreement on the appropriateness for inclusion compared to Round 3 and Round 1. An increased agreement on appropriateness was observed in PPH and OM clusters from 87.5% and 87.9%, respectively in Round 3 to 100% and 96.7%, respectively in Round 5. In Round 5, the PC and PP clusters maintained their 100% ratings from Round 3 (Table 5.19).

Table 5.19: Percentage and number of behavioural statements with agreement on appropriateness within each competency clusters across consensus measurement rounds

Competency cluster	Round-1 (%, number)	Round-3 (%, number)	Round-5 (%,number)
Pharmaceutical Public Health (PPH)	100 (8/8)	87.5 (7/8)	100 (8/8)
Pharmaceutical Care (PC)	82.2 (23/28)	100 (28/28)	100 (28/28)
Organisation and Management (OM)	72.7 (24/33)	87.9 (29/33)	96.7 (32/33)
Professional/Personal (PP)	90.9 (50/55)	100 (55/55)	100 (55/55)

Following the re-rating from Round 5, 125 behavioural statements of the competency framework met the predefined definition of consensus on appropriateness from the group except of behaviour 13.8 "understand the tendering methods and evaluation of tender bids" from "procurement" competency group, which remained a behaviour of disagreement in Round 5. Therefore, it was eliminated from the proposed competency framework.

The final framework consisted of 125 behavioural statements, grouped in 23 competencies under four competency clusters: PPH, PC, OM and PP. A detailed overview of the framework with the final scores of the medians and IQR is given in Table 5.20.

Table 5.20: Respondents appropriateness ratings of behavioural statements- Round 5.

Competency group			group agreement on the statement he current and future needs of the	
	practice			
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status	
Pharr	naceutical P	ublic Health Clus	ster (PPH)	
1. Emergency response	63	ar		
1.1 Participate in the response to	9	9-9	A === === == t	
public health emergencies	9	9-9	Agreement	
1.2 Assist the multidisciplinary				
healthcare teams in	9	9-9	Agreement	
emergency situations				
2. Health promotion				
2.1 Assess the		.5		
patient's/population's				
primary healthcare needs	8.50	8-9	Agroomen+	
(taking into account the	8.30	0-3	Agreement	
cultural and social setting of				
the patient/populations)				
2.2 Advise and provide services				
related to health promotion;	1000			
disease prevention and	9	8.25-9	Agreement	
control (e.g. vaccination); and				
healthy lifestyle				
2.3 Identify and support national	2200	8	===	
and local health priorities and	9	9-9	Agreement	
initiatives				
3 Medicines information and a	dvice			
3.1 Counsel the				
patient/population on the				
safe and rational use of				
medicines and devices				
(including the selection, use,	9	9-9	Agreement	
contraindications, storage,				
and side effects of non-				
prescription and prescription				
medicines)				
3.2 Identify sources, retrieve,				
evaluate, organise, assess and				
provide relevant and	9	9-9	Agreement	
appropriate medicines		1100(2000)		
information according to the				
needs of patients and clients	+			
3.3 Support the patient's use of				
health information	8	00	Agreement	
technologies and digital	٥	8-9	Agreement	
communication (including IT driven health solutions)				
	Dharmasa:-	ical care cluster	(PC)	
	rnarmaceut	ical care cluster	(FC)	
4 Assessment of medicines		1		
4.1 Gather, analyse, research, and	8		<u> </u>	
interpret information about	9	8.25-9	Agreement	
the patient and patient's	3271			
medicines-related needs (e.g.				

tatement ds of the
tatus

Competency group				group agreement on the statement he current and future needs of the practice
Beha	vioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
appropriat	e authorities			
	ns, ensuring that ns are correctly	9	9-9	Agreement
The state of the s	levices (e.g. inhaler glucose meter)	9	8-9	Agreement
6.5 Document dispensing	and the second of the second of the second	9	9-9	Agreement
dispensing misses foll	d report ALL n errors (including errors) and near owing relevant n error reporting	9	8.25-9	Agreement
	nedicines (with the nd appropriate n)	9	9-9	Agreement
6.8 Learn from	and act upon near misses' and	9	9-9	Agreement
7 Medicines				
storage co medicines medicines appropriat	ients on proper nditions of the and ensure that are stored ely (e.g. humidity, re, expiry date,	9	9-9	Agreement
formulatio concentrat ailments (e	cion for minor e.g. diarrhoea, on, cough, hay fever,	9	8.25-9	Agreement
7.3 Ensure app medicines, document		9	9-9	Agreement
7.4 Package m optimise sa appropriat	edicines to afety (ensuring e re-packaging and f the medicines)	9	8.25-9	Agreement
According to the control of the cont	nedicines therapy			
formulary	elines, medicines system, protocols nent pathways	9	9-9	Agreement

Competency group		The le	vel of experts' g	group agreement on the statement	
		appropriateness to the current and future needs of the			
		practice			
		Group's	Group's	100	
	Behavioural statement	Median	Interquartile range (IQR)	The consensus status	
8.2	Apply therapeutic medicines		runge (regry		
	monitoring and assess impact				
	and outcomes (including	9	8.25-9	Agreement	
	objective and subjective			-	
	measures)				
8.3	Identify, prioritise and resolve				
	medicines management	9	8.25-9	Agreement	
	problems (including errors)			****	
9	Patient consultation and diagno	osis compe	tency group		
9.1	Support urgent care needs				
	(physical and mental) of	_	0.0	Agreement	
	patients and others and act	9	8-9	=====================================	
	upon arranging follow-up care				
9.2	Appropriately refer the		7.25.0		
	patient or carer	8	7.25-9	Agreement	
9.3	Assess and support individual				
	self-care needs based on				
	objective and subjective	0.50	7.25.0	A	
	measures (where applicable)	8.50	7.25-9	Agreement	
	and participate in differential				
	diagnosis for minor illnesses				
9.4	Evaluate, assess, and develop				
	health literacy education and	9	8-9	Agraamant	
	counselling on medicines and	9	0-9	Agreement	
	healthcare needs				
9.5	Discuss and agree with the				
	patients on the appropriate	9	8.25-9	Agreement	
	use of medicines, taking into	9	G.ZJ-3	Agreement	
	account patients' preferences				
9.6	Document any intervention				
	(e.g. document allergies, such				
	as from medicines and	9	8.25-9	Agreement	
	nutrition in patient's				
	medicines history)				
9.7	Obtain, reconcile, review,				
	maintain and update relevant	9	9-9	Agreement	
	patient medication and			, <u>g</u>	
	diseases history				
Table 4		ation and I	Management clu	uster (OM)	
	Budget and reimbursement		1		
10.3	Acknowledge the workplace organisational structure	9	7.25-9	Agreement	
10.2	2Participate in setting and				
	applying budgets	7.50	6.25-8	Agreement	
10.3	3 Manage appropriate claims				
	for reimbursements (including	0 50	60	Agracment	
	those from governmental	8.50	6-9	Agreement	
	agencies or private entities)				

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice		
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
10.4 Ensure financial transparency by providing a complete, timely and accurate financial information relevant to area of practice	8	7-8	Agreement
10.5Ensure proper reference sources for service reimbursement	8	6.25-8.75	Agreement
11 Human resources management			
11.1 Demonstrate organisational and management skills (e.g. plan, organise and lead on medicines management; risk management; self-management; time management; people management; project management; policy management)	8	5-8	Agreement
11.2 Identify and manage human resources and staffing issues	8	6-8	Agreement
11.3 Recognise and manage the potential of each staff member and utilise systems for performance management (e.g. conduct staff appraisals)	9	7.25-9	Agreement
11.4 Recognise the value of the pharmacy team and of a multidisciplinary team	9	9 -9	Agreement
11.5 Support and facilitate staff training and continuing professional development	9	8-9	Agreement
12 Improvement of service			
12.1 Ildentify, implement and monitor new services (according to local needs)	8.50	7.25-9	Agreement
112.2 Resolve, follow up and prevent medicines related problems	9	9-9	Agreement
13 Procurement		1	
13.1 1Access reliable information and ensure the most cost-effective medicines in the right quantities with the appropriate quality	9	8-9	Agreement
13.2 Develop and implement contingency plan for shortages	9	8-9	Agreement
13.3 Efficiently link procurement to formulary or drug lists, to push/pull system (supply chain	8	8-9	Agreement

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the			
	practice			
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status	
management) and payment mechanisms				
13.4 Avoid and declare personal or professional conflict of interests, if and where they arise	8	8-9	Agreement	
13.5 Identify and select reliable supplier(s)	9	8-9	Agreement with the statement	
13.6 Select reliable supply of high- quality products (including appropriate selection and procurement processes, cost effectiveness, timely delivery)	8.5	7.25-9	Agreement	
13.7 Supervise procurement activities	8	7.25-9	Agreement	
13.8 Understand the tendering methods and evaluation of tender bids	7	2-7	Agreement on elimination	
14 Supply chain and management				
14.1 Demonstrate knowledge in store medicines to minimise errors and maximise accuracy	8.5	7.25-9	Agreement	
14.2 Verify the accuracy of rolling stocks	9	6.25-9	Agreement	
14.3 Ensure effective stock management and running of service with the dispensary	9	6.50-9	Agreement	
14.4 Ensure logistics of delivery and storage	8.50	6.50-9	Agreement	
14.5 Implement a system for documentation and record keeping	9	8-9	Agreement	
14.6 Take responsibility for quantification and supply chain forecasting	9	7.25-9	Agreement	
14.7 Mitigate risk of medicines shortages and stock outs through liaison and appropriate communication with healthcare staff, healthcare stakeholders, clients/customers and patients	9	8-9	Agreement	
15 Workplace management				
15.1 Address and manage day to day management issues	9	7.25-9	Agreement	
15.2 Demonstrate the ability to take accurate and timely decisions and make appropriate judgements	9	7.25-9	Agreement	
15.3 1Ensure the production schedules are appropriately planned and managed	8.5	7.25-9	Agreement	

Competency group	27.000 - 20.000 - 2.000	Proceeds and the second	group agreement on the statement he current and future needs of the
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	practice The consensus status
15.4 Ensure the work time is appropriately planned and managed	9	8-9	Agreement
15.5 1Improve and manage the provision of pharmaceutical services	9	8.25-9	Agreement
15.6 Recognise and manage pharmacy resources (e.g. financial, infrastructure)	8.50	8-9	Agreement
(0.0 × 0.0	ofessional/	Personal cluste	r (PP)
16 Communication skills			940 000
16.1Communicate clearly,			
precisely and appropriately while being a mentor or tutor	9	8.25-9	Agreement
16.2Communicate effectively with health and social care staff, support staff, patients, carer, family relatives and clients/customers, using lay terms and checking understanding	9	9-9	Agreement
16.3 Tailor communication that is appropriate to the patient's needs (including health literacy, cultural or language barriers, social needs, and emotional status)	9	9-9	Agreement
16.4Use appropriate communication skills (e.g. verbal and non-verbal) to establish and maintain rapport with the patient and others including when communicating through digital and electronic platforms	9	9-9	Agreement
16.5Use appropriate communication skills (e.g. verbal and non-verbal) to establish and maintain rapport with the patient and others including when communicating through digital and electronic platforms	9	8.25-9	Agreement
17 Continuing professional develo	pment (CP	D)	
17.1Document CPD activities	9	8-9	Agreement
17.2Engage with students/interns/residents	9	8.25-9	Agreement

Competency group			group agreement on the statement he current and future needs of the practice
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
17.3Evaluate accuracy of knowledge and skills	9	8.25-9	Agreement
17.4Identify learning and development needs	9	8-9	Agreement
17.5Evaluate learning and development progress	9	8-9	Agreement
17.6Identify if expertise is needed outside current scope of knowledge	8	7.25-9	Agreement
17.7Recognise own limitations and act upon them	9	8-9	Agreement
17.8Reflect on performance	8.5	8-9	Agreement
17.9Demonstrate engagement/participation in professional development and lifelong learning activities	8.5	8-9	Agreement
18 Digital literacy			
18.1Identify, manage, organise, store, and share digital information	9	7.5-9	Agreement
18.2Critically appraise, analyse, evaluate, and/or interpret digital information and their sources	8.5	8-9	Agreement
18.3 Where applicable, participate in digital health services that promote health outcomes and engage with digital technologies (e.g. social media platforms & mobile applications) to facilitate discussions with the patient and others	8.5	8-9	Agreement
18.4Maintain patient privacy and security of digital information related to the patient and workplace	9	9-9	Agreement
19 Interprofessional collaboration			
19.1Respect and acknowledge the expertise, roles and responsibilities of colleagues and other health professionals	9	8.25-9	Agreement
19.2Participate, collaborate, advise in therapeutic decision- making, and use appropriate referral in a multi-disciplinary team	9	8.25-9	Agreement
19.3 Engage in collaborative practice, research and service provision to optimise patient	8.5	8-9	Agreement

Competency group	ency group The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice		
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
health outcomes		50 day	
19.4Engage in relationship- building with health professionals allowing conflict resolution, teamwork, communication, and consultation	9	8-9	Agreement
19.5Demonstrate mutual respect and adopt shared values of the workplace and toward patient care	9	9-9	Agreement
20 Leadership and self-regulation			
20.1Apply assertiveness skills (inspire confidence)	8.5	8-9	Agreement
20.2Demonstrate leadership and practice management skills, initiative and efficiency	8.5	8-9	Agreement
20.3Document risk management (critical incidents)	9	8-9	Agreement
20.4Prioritise work, practice punctuality and time management	9	8.25-9	Agreement
20.5 Develop, implement and monitor innovative ideas	9	8-9	Agreement
20.6Recognise and describe emotional information about self and others (e.g. selfawareness, self-regulation, motivation, social skills and empathy)	8	8-9	Agreement
20.7Demonstrate flexibility and adaptability to a variety of conditions and circumstances	9	8-9	Agreement
20.8Recognise when affected by setbacks or stress and manage with effective coping strategies (resilience)	9	8-9	Agreement
21 Legal and regulatory practice			
21.1Apply regulatory affairs and the key aspects of pharmaceutical registration and legislation	9	8.25-9	Agreement
21.2Apply the principals of business economics and intellectual property rights including the basics of patent interpretation	9	8-9	Agreement
21.3Be aware of and identify the new medicines coming to the market	8	8-9	Agreement

Competency group	The level of experts' group agreement on the statement appropriateness to the current and future needs of the practice		
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
21.4Comply with legislation for drugs with the potential for abuse	9	9-9	Agreement
21.5Engage in appropriate marketing and sales	8	7-9	Agreement
21.6Engage with health and medicines policies	9	8.25-9	Agreement
21.7Recognise the steps needed to bring a medicine to the market including the safety, quality, efficacy and pharmacoeconomic assessments of the product	8.5	6.5-9	Agreement
22 Professional and ethical practic	e	<u> </u>	
22.1Demonstrate awareness and employment of local/national codes of ethics	9	8.25-9	Agreement
22.2Fulfil duty of care to the patient and the public	9	9-9	Agreement
22.3 Maintain privacy and confidentiality (with the patient and other healthcare professionals)	9	9-9	Agreement
22.4Comply with patient privacy legislation including documentation of information	9	8.25-9	Agreement
22.5Consider available evidence and support the patient to make informed choices about medicine use	9	8.25-9	Agreement
22.6Obtain patient consent (it can be implicit on occasion)	9	7.25-9	Agreement
22.7Recognise professional limitations of self and others in the team	9	9-9	Agreement
22.8Demonstrate professional responsibility for all decisions made and actions taken	9	9-9	Agreement
22.9Demonstrate awareness of socially accountable practice (including cultural and social needs; cultural safety, respect, and responsiveness; diversity, equity and inclusiveness)	8.5	8-9	Agreement
23 Quality assurance and research	in the wo	rkplace	
23.1 Apply research findings and understand risk-benefit analyses (e.g. pre-clinical, clinical trials, experimental clinical pharmacological research, and risk	8.5	7.25-9	Agreement

Competency group			roup agreement on the statement e current and future needs of the practice
Behavioural statement	Group's Median	Group's Interquartile range (IQR)	The consensus status
management)			
23.2Audit quality of service (meet local and national standards and specifications)	8.5	8-9	Agreement
23.3Develop and implement Standing Operating Procedures (SOP's)	9	7.25-9	Agreement
23.4 Ensure appropriate quality control tests are performed and managed appropriately	8	6.25-9	Agreement
23.5Ensure medicines are not counterfeit and adhere to quality standards	9	7.25-9	Agreement
23.6 Identify and evaluate evidence-base to improve the use of medicines and services	9	8-9	Agreement
23.7Identify, investigate, conduct, supervise and support research at the workplace (enquiry-driven practice)	8	7.25-9	Agreement
23.8Implement, conduct and maintain a reporting system of pharmacovigilance (e.g. report Adverse Drug Reactions)	9	8.25-9	Agreement
23.9Initiate and implement audit research activities	8.5	7-9	Agreement

5.6.7 Discussion

To our knowledge, this is the first development of a competency framework for foundation level pharmacists in Saudi Arabia. The process employed in this study is a common method that has been applied in development of health guidelines and policy, and practice development in a number of countries since the 1960s (Jones and Hunter, 1995). This study used an evidence-based tool to develop a profession-wide consensus on a list of core competencies and behavioural statements required to inform pharmacy education development, assure practice consistency and foster CPD across all sectors. The use of consensus methods in adapting a country-specific competency framework in this study was found to be effective, similar to previous studies conducted in other countries (Mucalo et al., 2016; The Pharmaceutical Society of Ireland, 2013; Al-Hagan et al., 2021).

Responses from the expert panel confirmed that the FIP GbCF version 2 is appropriate to the Saudi practice environment. However, some of the behaviours underwent modification to fit the local pharmacy practice needs. Consistent with the findings of the national survey of pharmacists in the previous phase of this research, PPH, PC and PP clusters scored the highest agreement on appropriateness for inclusion overall compared to the OM cluster. On a global level, findings from studies that assessed the relevance of the GbCF behaviours to their contexts were similar to those from this study (Mucalo et al., 2016; Al-Haqan et al., 2021; Udoh et al., 2018; Arakawa et al., 2020b).

The variation in the level of agreement among experts on the behaviours in the initially suggested competency framework might reflect the uncertainty about core competencies required for foundation level practitioners, as foundation level practice is not yet defined in Saudi Arabia. The disagreement observed in the behaviours in the consensus measurements rounds was mainly related to behaviours under OM and PC competencies. Of the 19 statements that received the lowest agreement ratings from the experts, 10 of them were perceived as 'not relevant' by the surveyed pharmacists in the previous phase of this study. This suggests consistency of agreement between both experts and pharmacists in

practice on the perceived inappropriateness of these behaviours to the current responsibilities and roles of pharmacists in the Saudi pharmacy practice environment.

During the consensus development discussions, the main factors that influenced experts' views about appropriateness included their practice settings (e.g. hospitals, community pharmacy, and industry), the capacity of the pharmacy institution (large, medium, small facility) and individual perceptions about the foundation level practice. Some experts on the panel indicated disagreement with the appropriateness of "compounding medicines" and "patient assessment and diagnosis" competencies under the PC cluster, given that these services were neither conducted nor routinely available in community settings. However, through discussion, there was an increased recognition of the value of the developed framework to help define and lay the foundations for new and current pharmacists to develop their competencies to provide the newly expanded services. For example, the experts agreed on the inclusion of the "patient assessment and diagnosis" competency, especially given the recent MOH regulation for medication therapy management and minor illnesses care services provision in community pharmacy (Ministry of Health, 2019). This inclusion supports evidence from previous studies about the need to involve clinical skills training in initial education and CPD activities to support delivery of these services by community pharmacists (Almansour et al., 2020b; Rasheed et al., 2020). For the "compounding medicines" competency, experts agreed on including it given the fact that it is an inherent core competency for all pharmacists regardless of their practice settings. The addition of two new competencies to the PC cluster was a significant amendment to the adapted framework, recognising that the provision of point of care testing and therapeutic substitutions are part of the progression towards advanced future pharmaceutical care services in community pharmacies.

Similar to studies conducted in other countries (Mucalo et al., 2016; Al-Haqan et al., 2021; Udoh et al., 2018; Arakawa et al., 2020b), behaviours in the OM cluster were the most disagreed on and the most amended behaviours in the present study. A

possible explanation for this might be that the application and appropriateness of the OM behaviours for foundation level pharmacists are often dependent on the local and national circumstances as the type and level of organisation and management tasks for pharmacists can be country specific (Mucalo et al., 2016). In the current study, the lowest level of agreement over appropriateness was for behaviours in "budget and reimbursement", "human resources management" and "procurement" which also aligns with the earlier findings of the national survey of pharmacists. This result may be explained by the fact that a majority of these activities are a responsibility of senior pharmacists at the organisational or sector level, rather than of foundation level pharmacists on a departmental level.

However, the government advocacy and support for nationals to establish a small and medium enterprise, as part of the Saudi Vision 2030 initiative, prompted the consensus on retaining and amending these competencies to support early career pharmacists to build in and scale up their administrative skills alongside their technical skills. Given that community pharmacy is based on private institutions and businesses, the consensus was a means to support entrepreneur pharmacists to establish and run their own business smoothly and independently, especially as 14-50% of routine tasks in community pharmacies are administrative in Saudi Arabia (Al-Arifi, 2013). These competencies will also be of great benefit to support pharmacists who wish to establish their community pharmacy business in underserved remote areas lacking quality pharmacy services and expert mentors (Almeman and Al-jedai, 2016; Badreldin et al., 2020; AlRuthia et al., 2018a; Almaghaslah et al., 2018).

To satisfy the government plans for new services in community pharmacy, an appropriate mix of professional scientific, organisation, management and personal competencies is required. Regardless of the level of the responsibility and practice, the final result of pharmacy institutions in the provision of healthcare requires not only technical scientific and clinical competencies of pharmaceutical care and public health but also a complementary mix of competencies in managing medicines supply, business operation, finance, procurement, self-regulation, communication

and teamwork (Meštrović, 2012). Furthermore, the continuous development and expansion of pharmacy roles and services require these competencies to be cultivated in pharmacists from the start of their training to assure timely and efficient quality service execution. Embedding these competencies into initial education will therefore facilitate a smooth transition from initial education to foundation level and eventually to an advanced and specialised practice. By that, not only will the quality and safety of patients' services be delivered to a minimum standards but also excellence in practice will be attained and maintained (Udoh et al., 2021).

5.6.7.1 Implication

After validation, this framework could serve as a basis for curriculum development to be competency-based, of high quality and appropriate to meet the country and its people's needs (Katoue and Schwinghammer, 2018). It will also help to inform the development of the licensure exam - not only to measure pharmacists' minimum knowledge for registration - but also to design appropriate activities to assess their competencies and fitness to practise. Such a framework could also assist registration authorities to design national assessment, CE and CPD training programmes at a national level to reduce the variation in competencies and of professional performance reported in previous research between local and overseas pharmacists; and between male and female pharmacists (Phase 2a).

As CPD activities are mandatory in Saudi Arabia, this framework will further help to provide foundations for developing post-registration pathway and building a new CPD model to support learning activities for pre and in-service pharmacists on a national level. It will also assist pharmacy institutions to implement consistent, harmonised and useful career development opportunities and initiatives to attain and maintain their pharmacists' fitness to practice at institutional level. It will also help in-service pharmacists in identifying learning gaps and advancing their careers.

The methods used in this study demonstrate a practical approach for other countries to adopt and adapt a global competency framework in the development

of a country specific competency framework. The unique design of this study demonstrates a replicable example on how the global competency framework can be used to create a profession-wide country-specific competency framework that reflects local practice and service needs and priorities.

Further work is necessary to qualitatively explore the opinions of other stakeholders, including policymakers and practising pharmacists, about the validity and acceptability of this framework as a road map for pharmacists' career development. Furthermore, a validation study is required to obtain feedback from practitioners in non-direct patient care roles, such as industry, regulatory, and academia, on the suitability of this framework as a developmental tool in those areas of practise. Finally, to ensure pharmacists' evolvement and role expansion, future research is suggested to develop an advanced level competency work for the inclusion of speciality services.

5.6.7.2 Limitations

Although the number of experts who participated in this study was moderate, the level of consensus was found appropriate, as demonstrated by the narrow IQR around the median values. The use of purposive sampling approach to identify and recruit experts might not have identified other potentially useful experts. Yet the selection of experts was guided by and validated with other local experts to ensure that the recruited participants were of recognised expertise in their pharmacy sector. The withdrawal of experts from the pharmaceutical industry might have led to limited insight into the developed framework's appropriateness to this area of practice. Nevertheless, there is no practical guide to determine how including more participants might alter the results of such study (Batt et al., 2020). There was a high proportion of male to female experts in the panel, but this reflects the gender distribution of pharmacists in Saudi Arabia. In the absence of empirical evidence or other information about core competencies required for pharmacists working in Saudi Arabia, using an expert panel approach for development of the first national foundation competency framework for pharmacists was found appropriate and

effective in this study similar to others elsewhere (Mucalo et al., 2016; The Pharmaceutical Society of Ireland, 2013; Al-Hagan et al., 2021).

5.6.8 Conclusion

Using an evidence-based approach, this study developed and proposed the first national competency framework for foundation level pharmacists in Saudi Arabia. The study determined the core competencies and behavioural statements needed to provide effective, high-quality pharmaceutical services. The proposed national competency framework could be used to achieve quality initial pharmacy education development and to support professional development for foundation level pharmacists in performing their current and developing new roles to best meet the country's pharmaceutical needs.

5.7 Chapter summary

This chapter provides a detailed description of phase 2 - two consecutive studies conducted to identify competencies required for effective professional performance in the local context. The first study investigated the relevance of the FIP GbCF v1 in the Saudi pharmacy practice environment while the second one used the FIP GbCF v2 as a source document to develop a profession-wide competency framework for foundation-level pharmacists in Saudi Arabia. The approach enabled this research phase to obtain greater consultation on the relevance and the appropriateness of a global competency framework to Saudi pharmacy practice from the pharmacists (in phase 2a), as well as pharmacy experts (in phase 2b). This informed the development of a unique profession-wide framework fit for purpose and relevant to all pharmacists in the Saudi pharmacy practice context.

Chapter 6: Education assessment- assessing curricular content of undergraduate pharmacy education programmes in Saudi Arabia

6.1 Introduction

This chapter describes phase 3 of this research- a case study of mapping two selected undergraduate pharmacy curricula against the identified competencies of the proposed national competency framework developed earlier. The chapter also presents the methods, data collection and data analysis as well as the findings and implications for practice for this phase of the study.

6.2 Aim

To assess the extent to which the current undergraduate pharmacy programmes in Saudi Arabia meet the identified competencies of the proposed national competency framework for foundation level pharmacist.

6.3 Objectives

- 6.3.1 To assess the extent to which the competencies of the proposed foundation competency framework are taught in the selected undergraduate curricula.
- 6.3.2 To compare the curricular contents of the selected undergraduate curricula in terms of similarities, differences, relative trends and weighting of the subject domains.
- 6.3.3 To identify courses and curricula subject domains that contribute to the accomplishment of each competency and competency clusters of the proposed foundation competency framework.

6.4 Methods

6.4.1 Study design

A curriculum mapping approach comprising framework analysis and content analysis was utilised in this study to assess the sampled two PharmD curricula. The details of how each method was used to address the objectives of this study are described in the following sections.

6.4.2 Sampling and selection

A purposive sampling was employed to select two PharmD curricula from two different schools in Saudi Arabia. As described previously in Chapter 3 (section 3.4.1.3), the choice of two PharmD curricula was informed by methodological reasons. School A was selected as the first public pharmacy school to obtain full national and international accreditation from the NCAAA and the ACPE (National Center for Academic Accreditation and Evaluation, 2022a; Accreditation Council for Pharmacy Education, 2022) whereas school B was chosen because, as the first pharmacy school, other colleges have considered it as a good example for pharmacy schools in Saudi Arabia (Asiri, 2011).

6.4.3 Data collection and analysis

A stepwise curriculum mapping approach Greatorex et al (2019) was employed in the data collection and analysis, as follows:

6.4.3.1 Defining the study aim and use

This study aimed to assess the extent to which local education meet the proposed foundation level pharmacy competency framework developed earlier in phase 2 (Chapter 5). As outlined in section 6.3, three objectives were developed to address the aim of the study.

6.4.3.2 Deciding what curricula will be considered

As the aim of this study was to analyse the curricular content, the intended curricula specified in the current course catalogue (or handbook) from the sampled two schools were used in this study for the content analysis.

6.4.3.3 Determining the key features of curriculum for the mapping process

In this stage, the key features used as a basis for the mapping process, including the data to be collected from the curriculum, the metrics for measurement, the coding frame and the code for the map were determined based on the study objectives as follows:

- For the objective 6.3.1, the behavioural statements within the competencies
 of the proposed national competency framework and the course learning
 outcomes were used to build a coding frame to guide the mapping process.
- For the objective 6.3.2, the contact hours of each course were used to compare the relative trends and the weighting of curricular subject domains between the two curricula.
- For the objective 6.3.3, the categorisation of the curriculum domains
 adopted the PHARMINE project guidelines (Atkinson, 2014) to characterise
 and compare the curricula domains as there is no local guideline to assist in
 the curricular categorisation process. The PHARMINE project guidelines is a
 list of seven curriculum subject domains that was developed by the
 PHARMINE project in 2011 to harmonise, organise and develop the
 European pharmacy education curricula (Table 6.1).

Table 6.1: List and description of the PHARMacy Education IN Europe (PHARMINE) curriculum subject domains (Atkinson, 2014)

Domain	Description
MATH	Maths and Physics
GEN	Generic
BIO	Biological Sciences
PHAR	Pharmaceutics / Technology / Formulation
CHEM	Pharmaceutical Chemistry and Pharmaceutical Biochemistry [Chemical
	Science]
PRAC	Pharmacy Practice / Pharmaceutical Care / Clinical Pharmacy / Law and Social
	Pharmacy
MED	Pharmacology and Medicinal Science

The key features used as a basis for the mapping process were defined as follows (see Table 6.2):

Table 6.2: List of definition of key features of curriculum used for the mapping process in this study

Key feature of curriculum	Definition
Programme	PharmD degree programme within each sampled school
Course	A unit of instruction that usually lasts one academic term led by one or more educators and has a set number of students enrolled
Contact hours	Timetabled teaching hours spent with teaching staff in a variety of ways, such as face-to-face lectures or laboratory practicals based on the intended teaching purpose
Credit hours	The amount of credit awarded for successful completion of one course for a semester of not less than 15 weeks
Learning outcome	Descriptions of the specific knowledge, skills, or expertise gained by the student as a result of a learning activity, such as a training session, seminar, or course
Course description	A brief summary of the significant learning experiences for a course including an overview of key content covered, skills and knowledge to be learned, and how it will benefit the student

These key features from each curriculum were then compiled and input into Microsoft Excel spreadsheets.

6.4.3.4 Collecting relevant information and sources of data

The relevant information were collected from the official curriculum documents of the two schools to establish data entry in the designed instruments. For school A, the full PharmD programme handbook was publicly available on the school website and included programme details including goals, regulations and requirements. It also included detailed information about all courses within the programme including a list of courses, description of courses, credit hours, contact hours, learning outcomes, assessment methods and teaching strategies. Information about the experiential training portion of the curriculum was also provided in a separate handbook.

For school B, the PharmD programme handbook was not publicly available, except for a list of courses and credit hours on the school website. Therefore, the school was contacted to request access to the relevant documents. Permission was granted for the list of courses, course descriptions, credit hours and contact hours. No information was provided for the courses learning outcomes within the four professional study years nor for the courses within the first preparatory year or experiential portion of the curriculum in the sixth year. So information about the preparatory year courses, including course descriptions and contact hours, which is common to all health sciences students, was collected from the university website. Professional course descriptions provided by the school were used to substitute the missing courses' learning outcomes. Less detail existed for experiential training, which was a list of rotations and credit hours provided by the school.

The curriculum documents were in English, the common language used for pharmacy teaching in Saudi Arabia.

6.4.3.5 Extracting data and inputting into a standard instrument

In this stage, the curriculum documents were read and re-read several times to establish familiarity with the data before data extraction. Each curriculum was then mapped by course and behavioural statements. That is, the learning outcomes (from school A) and course description (from school B) for each course in the curricula were examined to determine whether it taught each behavioural statement. The responses were entered into Excel spreadsheets as dichotomised responses (yes=1, no=0). Where course learning outcomes or course descriptions matched more than one behavioural statement, the response was recorded as yes (1) for all matching behaviours (Plaza et al., 2007). Where course learning outcomes or course descriptions did not match any behavioural statement, the response was recorded as No (0). For ease of representation and data analysis, competency clusters were separated into individual spreadsheets for each school. The behavioural statements of competencies and courses were cross-tabulated in the spreadsheets. To quantify curricula domains and courses, the course contact hours were extracted and input into separate spreadsheets.

Data collection was conducted between November 2021 and April 2022, with individual primary mapping of both curricula. Revisions were made throughout the mapping process after discussion with the research supervisors. The final revision was made with special attention paid to behaviours and competencies absent from both curricula; gaps and inconsistencies between the two curricula; the number of times each behaviour and competency were addressed in both curricula; and the planned devoted time for teaching each domain of the curricula.

6.4.3.6 Representing the consolidating findings

This final stage involved compiling the collected data for analysis and representation as follows:

Assessment of the extent to which sampled curricula met the proposed foundation level pharmacy competency framework in Saudi Arabia was conducted using qualitative content analysis. Tables and heat maps were used to graphically display which competencies and associated behaviours were emphasised relative to each other. To visualise the curricular emphasis at the level of behavioural statements within each competency cluster, the dichotomous data were reflected with the complete shading to indicate that the course did teach the behaviour in question or absence of shading to indicate that the course did not teach the behaviour (Plaza et al., 2007). To represent the curricula mapping at the course and competency cluster levels, the behaviours were collapsed into their respective clusters by summing the number of each behaviour within each competency cluster for each course. The intensity of shading was used to indicate cluster emphasis so the degree of intensity of shading was proportionate to number of behaviours. The total number of behaviours within a given cluster was represented as counts since the type of curricula and the qualitative content analysis adopted in this study would not provide a crude measure to be used or converted to accurate proportions or percentages reflecting the extent of competency coverage within a curriculum. Heat maps were left as grids to reflect the information obtained on the competency and course level (Plaza et al., 2007). To allow visual representation of the curriculum

progression, courses were listed in the spreadsheets as they were ordered in the documents.

Comparison of the curricular contents in terms of similarities, differences, relative trends and weighting of the curricular subject domains was conducted quantitatively using descriptive statistics. The categorisation of the curricular subject domains was conducted using the PHARMINE project guidelines (Atkinson, 2014). Contact hours were used as a measure of the curricular domain content and weight (Arakawa et al., 2020a). For visualisation, tables, heat maps and radar plots were used to display the relative weighting for each curriculum domain, syllabus time and tendency between the two curricula

Elective courses were not mapped since they were not common to all students. Given the lack of information about the advanced experiential portion of the curricula from school B, the final curricular maps only included the didactic portion of the intended sampled curricula to harmonise comparisons, analysis and visualisation processes. Therefore, the final analysis and representation of the sampled curricula included the required courses in the five years of study, i.e. 61 courses from school A and 66 courses from school B.

6.5 Results

6.5.1 General curricula characteristics

In both programmes, the first year is a preparatory year containing course work in the basic sciences, physical sciences, academic and medical English as well as information and communication technology. The following four professional study years comprised mainly course work in biomedical, pharmaceutical, and clinical sciences as well as social, behavioural and administrative pharmacy sciences. The final sixth professional year is the advanced experiential portion of the programme, which comprised a variety of clinical and non-clinical rotations. However, some differences exist between the two programmes in terms of required courses, credit hours, contact hours as well as introductory and advanced experience rotations. Table 6.3 shows the general characteristics of the two PharmD programmes.

The educational programme of school A consisted of 61 courses in a 10-semester programme implying 2729 contact hours. The advanced experiential portion of the curriculum is composed of seven core and three elective clinical rotations mostly in hospitals. For school B, the educational programme consisted of 66 courses in a 10-semester programme implying 4280 contact hours. Within the five professional years, four introductory pharmacy practice experience training sessions distributed over community pharmacy and hospital pharmacy practice settings were provided in years two, three and five. The advanced experiential portion of the curriculum provided in year six was composed of five core and five elective clinical rotations mostly in hospitals. Appendix 8 and Appendix 9 show a list of courses, credit hours and contact hours per study year in the school A and school B PharmD programmes.

Table 6.3: General characteristics of the sampled programmes

School	Programme offered*	Accreditation*	Years of Study**	Number of courses and experiential training rotations**	Number of credit hours **	Number of contact hours	Number of enrolled students in academic year 2019-2020****
School A	PharmD	-National: NCAAA (full) -International: ACPE certificate	5 years+ 1 year advanced pharmacy practice experience training	61 courses + 10 clinical rotations	165 hrs courses +30 hrs rotations	2729 hrs courses + 2000 hrs rotations (200 hrs/ rotation)	959
School B	PharmD	-National: NCAAA (conditional) -International: ACPE certificate	5 years (including Summer introductory pharmacy practice experience)+ 1 year advanced pharmacy practice experience training	66 courses +10 clinical rotations	158 credit hours courses +30 hrs rotations	4280 hours courses***	1020

Resources:

^{*}School A programme Handbook, School B Programme handbook

^{**}National Centre for Academic Accreditation and Evaluation (2022), Accreditation Council for Pharmacy Education (2022)

^{***}No information provided about the rotations contact hours

^{****}Ministry of Health Statistical Yearbook (2020)

6.5.2 Trends and weightings of the sampled curricula

Within the sampled programmes, Table 6.4 illustrates that the weighting of seven curricular subject domains varies in most domains between school A and school B.

Table 6.4: Proportion of each curriculum subject domain in total curricular time of school A and school B

School	Proportion	of curriculu	ım domain fr	om a total c	urricular tim	e in School A	and B (%)	Total timetables
	MATH	GEN	BIO	PHAR	CHEM	PRAC	MED	curricular time
								(contact
								hours)
School A	42 (1.54)	208	251	321	416	691	800	2729
		(7.62)	(9.19)	(11.76)	(15.24)	(25.32)	(29.31)	(100)
School B	75 (1.75)	510	225	390	210	2030	840	4280
		(11.91)	(5.25)	(9.11)	(4.90)	(47.42)	(19.62)	(100)

The heat map in Figure 6.1 shows that the variation between school A and school B occurred in the GEN, BIO, PHAR, CHEM, PRAC and MED curricular domains. School A placed more emphasis on the total curricular time of science domains, including MED, CHEM and BIO compared to school B. In school A, MED (29.31%) followed by the PRAC (25.32%) and CHEM (15.24%) domains accounted for more curricular time, whereas there was more emphasis on the PRAC (47.42%) domain followed by the MED (19.62%) and GEN (11.91%) domains in school B. Both schools had a comparable emphasis on the MATH (1.54% and 1.75%, respectively) and PHAR (11.76%, 9.11%, respectively) domain of the total curricular time.

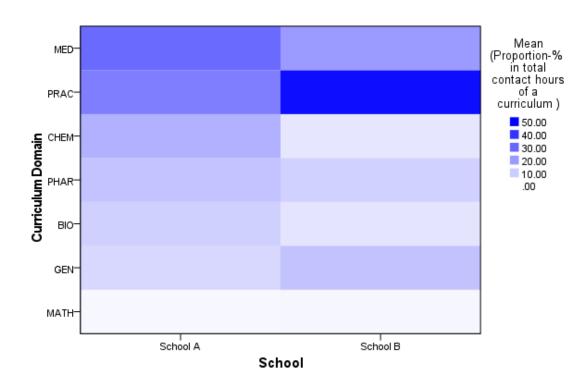


Figure 6.1: Proportion of the seven curriculum subject domains in total curricular time of school A and school B

To examine the proportion of the science and practice in the two curricula, the seven curricular domains were further categorised into three groups: the chemistry group included CHEM, PHAR, and MATH, the physical science group included BIO and MED, while the practice group included the PRAC and GEN domains. Proportion of the three curricular categories from the total contact hours shows that school A tends to have a more physical science-focused curriculum (38.5%) while school B tends to have a more practice-focused curriculum (59.33%) (Figure 6.2).

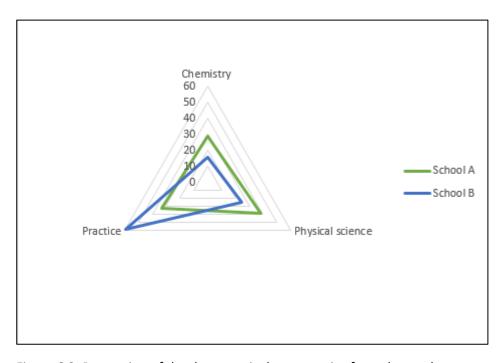


Figure 6.2: Proportion of the three curricular categories from the total contact hours in School A and School B

6.5.3 Map of the sampled curricula to the competency framework by course and study year

6.5.3.1 Overall findings

Table 6.5 and Table 6.6 show the overall mapping findings from school A and school B by course, competency clusters and study year while Table 6.7 and Table 6.8 show the detailed mapping findings from mapping each competency groups within clusters by course and study year from school A and school B. The curricular maps of school A and school B by course, competency clusters and study year in Table 6.7 and Table 6.8 show that most competencies were covered throughout the five study years. Of the 23 competencies within the proposed national competency framework, 21 (91.30%) and 18 (78.26%) of the competencies were covered in the curricula A and B, respectively.

Table 6.5: Map of curriculum A to competency clusters of the proposed national competency framework by course and study year

Year	Course	PPH	PC	OM	PP
	Medical terminology	0	0	0	1
	Mathematics for Pharmacy	0	1	0	0
	Human Biology	0	1	0	0
	Organic Chemistry	0	1	0	0
Year	Human Anatomy and Histology	0	1	0	0
1	Introduction to Pharmacy Profession	1	2	0	6
	Biostatistics	0	0	0	1
	Pharmaceutical Organic Chemistry	0	1	0	0
	Pharmaceutical Microbiology	1	1	0	0
	Pharmaceutical Analytical Chemistry	0	0	0	2
	Biochemistry-1	0	1	0	0
	Physiology-1	0	1	0	0
	Phatmaceutics-1	0	2	0	2
	Pharmacognosy	0	1	0	3
	Computer for Health sciences	1	0	0	3
	Pharmacy Practice	1	1	1	5
Year 2	General Immunology	0	1	0	0
	Biochemistry-2	0	1	0	0
	Physiology-2	0	1	0	0
	Medicinal Chemistry-1	0	2	0	1
	Pharmacology-1	0	1	0	0
	Molecular Pharmacology	0	1	0	0
	Pharmaceutics-2	0	2	0	1
	Medicinal Chemistry-2	0	2	0	1
	Pathophysiology	0	1	0	0
	Pharmacology-2	0	2	0	0
	Chemotherapy	0	1	0	0
V	Natural Products Chemistry	0	1	0	3
Year 3	Pharmacopeial Analysis	0	0	0	2
	Medicinal Chemistry-3	0	2	0	1
	Pathophysiology-2	0	1	0	0
	Pharmaceutics-3	0	3	0	2
	Pharmacology-3	0	1	0	0
	Scientific Writing and Seminar	1	0	0	3
	Pharmacotherapy-1	0	3	0	4
	Pharmacology-4	0	2	0	0
,,	Toxicology	1	5	0	0
Year 4	Pharmaceutical Biotechnology	0	2	0	2
	Basic Pharmacokinetics	0	2	0	0
	Dispensing of Medication	1	6	0	1
	Radiopharmacy	0	2	0	0

Year	Course	PPH	PC	ОМ	PP
	Pharmacogenomics	2	1	0	1
	Biopharmaceutics	0	2	0	1
	Clinical Communication Skills	0	0	0	3
	Ethics in Pharmacy	0	0	1	6
	Pharmacotherapy-2	0	3	0	4
	Drug & Poison Information services & Literature Evaluation	1	0	2	3
	Over the Counter Drugs	1	7	0	1
	Patient Assessment and First Aid	1	5	0	1
	Pharmacotherapy-3	0	4	0	0
	Pharmacoeconomics & Epidemiology	0	0	0	7
	Pharmacy Management	0	0	8	1
	Evidence Based Pharmacy	1	0	0	4
	Pharmaceutical Care	0	4	2	2
Year	Applied Pharmacokinetics	1	6	0	3
5	Clinical Nutrition & IV Administration	0	5	0	2
	Pharmacy Law	0	0	0	5
	Scientific Writing and Seminar-2	0	0	0	4
	Drug of Abuse	1	0	0	1
	Pharmacotherapy-4	1	4	0	4
	Graduation Project	0	0	0	6
Total co	ounts per cluster	16 (6.86%)	100 (42.91%	14 (6.00%)	103 (44.20%)

^{*}The value (0) in the table indicates that the course learning outcomes or course descriptions did not match any behavioural statement of the proposed competency framework. In cases where course learning outcomes or course descriptions matched more than one behavioural statement, the response was recorded as (1) for all matching behaviours. As a result, the degree of intensity of shading in these tables is proportionate to number of behaviours.

Table 6.6: Map of curriculum B to competency clusters of the proposed competency framework by course and study year

	ork by course and study year	DDU	DC.	ONA	DD
Year	Course	PPH	PC	OM	PP 1
	English	0	0	0	1
	IT skills Fitness and health education	1	0	0	2
Year 1		2	0	0	0
	University skills	0	0	0	1
	Biostatistics	0	0	0	1
	English	0	0	0	1
	Pharmaceutical calculation	0	1	0	0
	The introductory pharmacy practice experience-1	0	0	0	2
	Pharmaceutical organic chemistry	0	1	0	0
	Anatomy	0	1	0	0
	Biochemistry-1	0	1	0	0
Year 2	Physiology-1	0	1	0	0
	Basics of natural products	0	1	0	1
	Pharamcutics-1	0	2	0	1
	Medicinal Chemistry-1	0	1	0	0
	Introduction to Pharmacy Profession	0	0	0	2
	Biochemistry-2	0	1	0	0
	Physiology-2	0	1	0	0
	Pharmaceutics-2	0	2	0	2
	Dietary Supplements	0	1	0	0
	The Introductory Pharmacy Practice Experience-2	1	6	1	2
	Pharmacy information Systems	1	0	0	0
	Medicinal Chemistry-II	0	1	0	0
	Pharmacy Practice Lab-1	1	6	0	2
Year 3	Pharmacology-1	0	2	0	0
	The Introductory Pharmacy Practice Experience-3	1	6	1	1
	Pharmacy Practice lab-2	1	6	0	2
	Complementary and Alternative Medicine	0	1	0	0
	Drug Discovery General Immunology	0			-
	Pharmacology-II	0	1	0	0
		0	1	0	0
	Introduction to Pathophysiology Pharmacy in Health System	0	0	0	1
	Pathophysiology and Therapeutics-1		1	0	0
	Pharmacy Practice Lab-3	0	2	0	
	Pathophysiology and Therapeutics-2	1		0	3
	·	0	1		2
Year 4	Evidence-based Herbal Medicine	0	1	0	0
	Clinical Microbiology	0	2	0	0
	Pharmacology 3		5		
	Biopharmaceutics and Pharmacokinetic	0		0	0
	Pathophysiology and Therapeutics-3	1	1	0	1
	Pharmacy Practice Lab-4	1	6	0	2

Year	Course	PPH	PC	ОМ	PP
	Pathophysiology and Therapeutics-4	0	4	0	0
	Clinical Immunology	0	1	0	0
	Pharmaceutical Biotechnology	0	1	0	0
	Sterile & parenteral preparations	0	3	0	1
	Toxicology	1	1	0	0
	Pharmacy laws and Ethics	0	0	0	3
	Pharmacoeconomics	0	0	0	3
	Pathophysiology and Therapeutics-5	0	3	0	0
	Pharmacy Practice Lab 5	0	5	0	0
	The Introductory Pharmacy Practice Experience-4	2	5	1	2
	Pathophysiology and Therapeutics-6	1	1	0	1
	Research design and Pharmacoepidemiology	0	0	0	4
	Medication Therapy Management-1	1	3	0	0
Year 5	Applied Pharmacokinetics	0	3	0	0
	Pharmacy management and marketing	0	0	1	1
	Pathophysiology and Therapeutics-7	1	1	0	1
	Pathophysiology and Therapeutics-8	1	1	0	1
	Pharmacy Practice Lab-6	0	0	0	2
	Project and Seminar	0	0	0	3
	Drug Information/Literature evaluation	1	0	0	1
	Medication therapy management-2	1	3	0	0
Total cou	unts per cluster	21 (11.43%)	102 (55.43%)	4 (2.17%)	57 (30.97%)

^{*}The value (0) in the table indicates that the course learning outcomes or course descriptions did not match any behavioural statement of the proposed competency framework. In cases where course learning outcomes or course descriptions matched more than one behavioural statement, the response was recorded as (1) for all matching behaviours. As a result, the degree of intensity of shading in these tables is proportionate to number of behaviours.

Table 6.7: Map of curriculum A to competencies of the proposed national competency framework by course and study year

	Competency cluster		PF	РΗ				PC					ON	1						PF	•			
Stud Y year	Competency group (total behaviours within group) Courses within curriculum A	1.Emergency response (2)	2.Health promotion (3)	3.Medicines information & advice (3)	4.Assessment of medicines (6)	5.Compinding of medicines (2)	6.Dispensing (8)	7.Medicines (4)	8.Monitor medicines therapy (3)	9.Patient consultation & diagnosis (7)	10.Budget & reimbursement (5)	11.Human resources & management (5)	12.Imporovment of service (2)	13.Procurment (7)	14.Supply chain & management (7)	15.Workplace management (6)	16.Communication skills (4)	17.CPD (9)	18.Digital literacy (4)	19.Interprofessional collaboration (5)	20.Leadership & self-regulation (8)	21.Legal & regulatory practice (7)	22.Professional ðical practice (9)	23.Quality assurance & research (9)
	Medical terminology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Mathematics for Pharmacy	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Human Biology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Organic Chemistry	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Human Anatomy and Histology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year 1	Introduction to Pharmacy Profession	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2	2	1
	Biostatistics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Pharmaceutical Organic Chemistry	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Microbiology	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Analytical Chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Biochemistry-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physiology-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year 2	Phatmaceutics-1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Pharmacognosy	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
	Computer for Health sciences	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0

	Competency cluster		PF	Н				PC					ON	1						PP	•			
Stud Y year	Competency group (total behaviours within group) Courses within curriculum A	1.Emergency response (2)	2.Health promotion (3)	3.Medicines information & advice (3)	4.Assessment of medicines (6)	5.Compinding of medicines (2)	6.Dispensing (8)	7.Medicines (4)	8.Monitor medicines therapy (3)	9.Patient consultation & diagnosis (7)	10.Budget & reimbursement (5)	11.Human resources & management (5)	12.Imporovment of service (2)	13.Procurment (7)	14.Supply chain & management (7)	15.Workplace management (6)	16.Communication skills (4)	17.CPD (9)	18.Digital literacy (4)	19.Interprofessional collaboration (5)	20.Leadership & self-regulation (8)	21.Legal & regulatory practice (7)	22. Professional & ethical practice (9)	23.Quality assurance & research (9)
	Pharmacy Practice	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	1	0	1
	General Immunology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biochemistry-2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physiology-2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicinal Chemistry-1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Pharmacology-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molecular Pharmacology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutics-2	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Medicinal Chemistry-2	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Pathophysiology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-2	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chemotherapy	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year	Natural Products Chemistry	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
3	Pharmacopeial Analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Medicinal Chemistry-3	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Pathophysiology-2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutics-3	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Pharmacology-3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Competency cluster		PP	Н				PC					ON	1						PP	•			
Stud Y year	Competency group (total behaviours within group) Courses within curriculum A	1.Emergency response (2)	2.Health promotion (3)	3.Medicines information & advice (3)	4. Assessment of medicines (6)	5.Compinding of medicines (2)	6.Dispensing (8)	7.Medicines (4)	8.Monitor medicines therapy (3)	9.Patient consultation & diagnosis (7)	10.Budget & reimbursement (5)	11.Human resources & management (5)	12.Imporovment of service (2)	13.Procurment (7)	14.Supply chain & management (7)	15.Workplace management (6)	16.Communication skills (4)	17.CPD (9)	18.Digital literacy (4)	19.Interprofessional collaboration (5)	20.Leadership & self-regulation (8)	21.Legal & regulatory practice (7)	22.Professional ðical practice (9)	23.Quality assurance & research (9)
	Scientific Writing and Seminar	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1
	Pharmacotherapy-1	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
	Pharmacology-4	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Toxicology	1	0	0	1	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Biotechnology	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	Basic Pharmacokinetics	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dispensing of Medication	0	0	1	1	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Radiopharmacy	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year	Pharmacogenomics	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
4	Biopharmaceutics	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Clinical Communication Skills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
	Ethics in Pharmacy	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	4	0
	Pharmacotherapy-2	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
	Drug & Poison Information services & Literature Evaluation	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	1
	Over the Counter Drugs	0	0	1	1	0	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Patient Assessment and First Aid	1	0	0	1	0	0	0	1	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0

	Competency cluster		PF	РН				PC					ON	1						PF	•			
Stud Y year	Competency group (total behaviours within group) Courses within curriculum A	1.Emergency response (2)	2.Health promotion (3)	3.Medicines information & advice (3)	4. Assessment of medicines (6)	5.Compinding of medicines (2)	6.Dispensing (8)	7.Medicines (4)	8.Monitor medicines therapy (3)	9.Patient consultation & diagnosis (7)	10.Budget & reimbursement (5)	11.Human resources & management (5)	12.Imporovment of service (2)	13.Procurment (7)	14.Supply chain & management (7)	15.Workplace management (6)	16.Communication skills (4)	17.CPD (9)	18.Digital literacy (4)	19.Interprofessional collaboration (5)	20.Leadership & self-regulation (8)	21.Legal & regulatory practice (7)	22.Professional ðical practice (9)	23.Quality assurance & research (9)
	Pharmacotherapy-3	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacoeconomics & Epidemiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	6
	Pharmacy Management	0	0	0	0	0	0	0	0	0	2	4	0	1	1	0	0	0	0	0	0	1	0	0
	Evidence Based Pharmacy	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2
	Pharmaceutical Care	0	0	0	1	0	0	1	1	1	1	0	1	0	0	0	0	0	0	1	0	1	0	0
Year	Applied Pharmacokinetics	0	0	1	2	1	0	1	2	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0
5	Clinical Nutrition & IV Administration	0	0	0	1	2	0	1	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	Pharmacy Law	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0
	Scientific Writing and Seminar- 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
	Drug of Abuse	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Pharmacotherapy-4	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	2	1	0	0	0	0	0	1
	Graduation Project	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	3
	ounts per competency group	2 (0.8 5%)	2 (0.8 5%)	12 (5.1 5%)	11 (4.7 2%)	17 (7.2 9%)	6 (2.5 7%)	43 (18. 45%)	13 (5.5 7%)	10 (4.2 9%)	3 (1.2 8%)	5 (2.1 4%)	2 (0.8 5%)	2 (0.8 5%)	2 (0.8 5%)	0	23 (9.8 7%)	6 (2.5 7%)	7 (3.0 0%)	8 (3.4 3%)	0	15 (6.4 3%)	9 (3.8 6%)	35 (15. 02%)

The value (0) in the table indicates that the course learning outcomes or course descriptions did not match any behavioural statement of the proposed competency framework. In cases where course learning outcomes or course descriptions matched more than one behavioural statement, the response was recorded as (1) for all matching behaviours. As a result, the degree of intensity of shading in these tables is proportionate to number of behaviours.

Table 6.8: Map of curriculum B to competencies of the proposed national competency framework by course and study year

	Competency cluster		PP	Н				PC					OI	М						PP				
Stud y year	Competency group (total behaviours within group) Courses within curriculum B	1.Emergency response (2)	2.Health promotion (3)	3.Medicines information & advice (3)	4.Assessment of medicines (6)	5.Compinding of medicines (2)	6.Dispensing (8)	7.Medicines (4)	8.Monitor medicines therapy (3)	9.Patient consultation & diagnosis (7)	10.Budget & reimbursement (5)	11.Human resources & management (5)	12.Imporovment of service (2)	13.Procurment (7)	14.Supply chain & management (7)	15.Workplace management (6)	16.Communication skills (4)	17.CPD(9)	18.Digital literacy (4)	19.Interprofessional collaboration (5)	20.Leadership & self-regulation (8)	21.Legal & regulatory practice (7)	22.Professional ðical practice (9)	23.Quality assurance & research (9)
	English	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	IT skills	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	Fitness and health education	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University skills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Year 1	Biostatistics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	General zoology							No r	napping	results	due 1	to lack o	f info	rmation	n abo	ut thi	s course	9						
	Physics							No r	napping	results	due 1	to lack o	of info	rmation	n abo	ut thi	s course	e						
	Introduction to organic chemistry							No r	napping	results	due 1	to lack o	of info	rmation	n abo	ut thi	s course	9						
	English	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Pharmaceutical calculation	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	The introductory pharmacy practice experience-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0
Year	Pharmaceutical organic chemistry	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Anatomy	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biochemistry-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physiology-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Competency cluster		PP	PH H				PC					0	M						PP				
Stud Y year	Competency group (total behaviours within group) Courses within curriculum B	1.Emergency response (2)	2.Health promotion (3)	3.Medicines information & advice (3)	4. Assessment of medicines (6)	5.Compinding of medicines (2)	6.Dispensing (8)	7.Medicines (4)	8.Monitor medicines therapy (3)	9.Patient consultation & diagnosis (7)	10.Budget & reimbursement (5)	11.Human resources & management (5)	12.Imporovment of service (2)	13.Procurment (7)	14.Supply chain & management (7)	15.Workplace management (6)	16.Communication skills (4)	17.CPD (9)	18.Digital literacy (4)	19. Interprofessional collaboration (5)	20.Leadership & self-regulation (8)	21.Legal & regulatory practice (7)	22. Professional ðical practice (9)	23.Quality assurance & research (9)
	Basics of natural products	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Pharamcutics-1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Medicinal Chemistry-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Introduction to Pharmacy Profession	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Biochemistry-2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physiology-2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutics-2	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Dietary Supplements	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	The Introductory Pharmacy Practice Experience-2	0	0	1	0	2	2	1	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0
	Pharmacy information Systems	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year	Medicinal Chemistry-II	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Pharmacy Practice Lab-1	0	0	1	1	2	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0
	Pharmacology-1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	The Introductory Pharmacy Practice Experience-3	0	0	1	0	2	2	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0
	Pharmacy Practice lab-2	0	0	1	1	2	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0
	Complementary and Alternative Medicine	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0

	Competency cluster		PF	PH				PC					0	M						PP				
Stud Y year	Competency group (total behaviours within group) Courses within curriculum B	1.Emergency response (2)	2.Health promotion (3)	3.Medicines information & advice (3)	4.Assessment of medicines (6)	5.Compinding of medicines (2)	6. Dispensing (8)	7.Medicines (4)	8.Monitor medicines therapy (3)	9.Patient consultation & diagnosis (7)	10.Budget & reimbursement (5)	11.Human resources & management (5)	12.Imporovment of service (2)	13.Procurment (7)	14.Supply chain & management (7)	15.Workplace management (6)	16.Communication skills (4)	17.CPD (9)	18.Digital literacy (4)	19.Interprofessional collaboration (5)	20. Leadership & self-regulation (8)	21.Legal & regulatory practice (7)	22. Professional ðical practice (9)	23.Quality assurance & research (9)
	Drug Discovery	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	General Immunology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-II	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Introduction to Pathophysiology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy in Health System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Pathophysiology and Therapeutics-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab-3	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	0	1	0
	Pathophysiology and Therapeutics-2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Evidence-based Herbal Medicine	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
Year	Clinical Microbiology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Pharmacology 3	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biopharmaceutics and Pharmacokinetic	0	0	0	2	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-3	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Pharmacy Practice Lab-4	0	0	1	1	2	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0
	Pathophysiology and Therapeutics-4	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Clinical Immunology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Competency cluster		PP	PH				PC					0	М						PP				
Stud Y year	Competency group (total behaviours within group) Courses within curriculum B	1.Emergency response (2)	2.Health promotion (3)	3.Medicines information & advice (3)	Assessment of medicines (6)	S.Compinding of medicines (2)	5. Dispensing (8)	r.Medicines (4)	8.Monitor medicines therapy (3)	9.Patient consultation & diagnosis (7)	10.Budget & reimbursement (5)	11. Human resources & management (5)	12.Imporovment of service (2)	13. Procurment (7)	14.Supply chain & management (7)	15.Workplace management (6)	L6.Communication skills (4)	17.CPD (9)	18.Digital literacy (4)	19.Interprofessional collaboration (5)	20. Leadership & self-regulation (8)	21.Legal & regulatory practice (7)	22. Professional ðical practice (9)	23.Quality assurance & research (9)
	Pharmaceutical Biotechnology	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sterile & parenteral preparations	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Toxicology	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy laws and Ethics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0
	Pharmacoeconomics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1
	Pathophysiology and Therapeutics-5	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab 5	0	0	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	The Introductory Pharmacy Practice Experience-4	0	0	2	0	2	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	1
	Pathophysiology and Therapeutics-6	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Year 5	Research design and Pharmacoepidemiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
	Medication Therapy Management-1	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Applied Pharmacokinetics	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy management and marketing	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
	Pathophysiology and Therapeutics-7	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Pathophysiology and Therapeutics-8	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

	Competency cluster		PP	Ч				PC					10	М						PP	1			
Stud y year	Competency group (total behaviours within group) Courses within curriculum B	1. Emergency response (2)	2. Health promotion (3)	3.Medicines information & advice (3)	4. Assessment of medicines (6)	5.Compinding of medicines (2)	6. Dispensing (8)	7.Medicines (4)	8.Monitor medicines therapy (3)	9. Patient consultation & diagnosis (7)	10.Budget & reimbursement (5)	11.Human resources & management (5)	12.Imporovment of service (2)	13.Procurment (7)	14.Supply chain & management (7)	15.Workplace management (6)	16.Communication skills (4)	17.CPD (9)	18.Digital literacy (4)	19.Interprofessional collaboration (5)	20.Leadership & self-regulation (8)	21.Legal & regulatory practice (7)	22.Professional ðical practice (9)	23.Quality assurance & research (9)
	Pharmacy Practice Lab-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
	Project and Seminar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	Drug Information/Literature evaluation	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Medication therapy management-2	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	counts per competency group	2 (1.0 8%)	6 (3.2 6%)	13 (7.0 6%)	12 (6.5 2%)	17 (9.2 3%)	8 (4.3 4%)	45 (24. 45%)	9 (4.8 9%)	11 (5.9 7%)	0	1 (0.5 4%)	0	3 (1.6 3%)	0	0	9 (4.8 9%)	1 (0.5 4%)	2 (1.0 8%)	2 (1.0 8%)	0	14 (7. 6%)	6 (3.2 6%)	23 (12. 50%)

The value (0) indicates that the course learning outcomes or course descriptions did not match any behavioural statement of the proposed competency framework. In cases where course learning outcomes or course descriptions matched more than one behavioural statement, the response was recorded as (1) for all matching behaviours. As a result, the degree of intensity of shading in these tables is proportionate to number of behaviours.

OM and PPH clusters and their associated competencies appeared to receive less emphasis at the course level compared to PP and PC clusters in the two curricula. At the OM and PPH level, the intensity of OM shading in school A was higher than in school B (6.00%, 2.17%, respectively), while the intensity of PPH shading was higher in school B than in school A (11.41%, 6.86%, respectively). In school A, the shading in the PP cluster appeared to be of high intensity similar to the PC cluster (44.20%, 42.91%, respectively), whereas in school B, the shading intensity in the PC cluster appeared to be higher than the intensity of shading in the PP cluster (55.43%, 30.97%, respectively).

Across years of study, the curricular maps show that there was more emphasis in advanced years compared to earlier years. PPH and OM clusters show a relatively small increase in shading over the years compared to PP and PC which show a steady and gradual increase in shading from the early years (Table 6.5 and Table 6.6).

6.5.3.2 PPH cluster

At the level of competency groups within each cluster (Table 6.9 and Table 6.10), the number of cells with shading within the PPH cluster from both schools appeared to be higher in "medicines information and advice" (5.5% and 7.06%, respectively) compared to "emergency response" and "health promotion" competency groups.

Across the behaviours of the PPH, behaviour 3.2 "Identify sources, retrieve, evaluate, organise, assess and provide relevant and appropriate medicines information according to the needs of patients and clients" under "medicines information and advice" group appeared to receive high emphasis at the course level. Following behaviour 3.2, behaviour 3.1 "Counsel the patient/population on the safe and rational use of medicines and devices (including the selection, use, contraindications, storage, and side effects of non-prescription and prescription medicines)" and behaviour 2.2 "Advise and provide services related to health promotion; disease prevention and control (e.g. vaccination); and healthy lifestyle" appeared to have similar shading compared to other behaviours within the PPH cluster in school A and school B, respectively. Behaviours of "emergency response" competency group received little emphasis at the course level in both curricula (school A=0.85%, school B=1.08%).

Table 6.9: Mapping of PPH behaviours with curriculum A by course and study year.

				Pha	rmaceutica	l Public Hea	alth		
Year		1. Emergen	cy response		lealth promot			nes informatio	n & advice
	Course name	1.1	1.2	2.1	2.2	2.3	3.1	3.2	3.3
	Medical terminology	0	0	0	0	0	0	0	0
	Mathematics for Pharmacy	0	0	0	0	0	0	0	0
	Human Biology	0	0	0	0	0	0	0	0
	Organic Chemistry	0	0	0	0	0	0	0	0
Year 1	Human Anatomy and Histology	0	0	0	0	0	0	0	0
icai 1	Introduction to Pharmacy Profession	0	0	0	0	0	0	1	0
	Biostatistics	0	0	0	0	0	0	0	0
	Pharmaceutical Organic Chemistry	0	0	0	0	0	0	0	0
	Pharmaceutical Microbiology	0	0	0	1	0	0	0	0
	Pharmaceutical Analatical Chemistry	0	0	0	0	0	0	0	0
	Biochemistry-1	0	0	0	0	0	0	0	0
	Physiology-1	0	0	0	0	0	0	0	0
	Phatmaceuutics-1	0	0	0	0	0	0	0	0
	Pharmacognosy	0	0	0	0	0	0	0	0
	Computer for Health sciences	0	0	0	0	0	0	0	1
Year 2	Pharmacy Practice	0	0	0	0	0	0	0	0
redi Z	General Immunology	0	0	0	0	0	0	0	0
	Biochemistry-2 Physiology-2	0	0	0	0	0	0	0	0
	Medicinal Chemistry-1	0	0	0	0	0	0	0	0
	Pharmacology-1	0	0	0	0	0	0	0	0
	Molecular Pharmacology	0	0	0	0	0	0	0	0
	Pharmaceutics-2	0	0	0	0	0	0	0	0
	Medicinal Chemistry-2	0	0	0	0	0	0	0	0
	Pathophysiology	0	0	0	0	0	0	0	0
	Pharmacology-2	0	0	0	0	0	0	0	0
	Chemotherapy	0	0	0	0	0	0	0	0
	Natural Products Chemistry	0	0	0	0	0	0	0	0
Year 3	Pharmacopeial Analysis	0	0	0	0	0	0	0	0
	Medicinal Chemistry-3	0	0	0	0	0	0	0	0
	Pathophysiology-2	0	0	0	0	0	0	0	0
	Pharmaceutics-3	0	0	0	0	0	0	0	0
	Pharmacology-3	0	0	0	0	0	0	0	0
	Scientific Writing and Seminar	0	0	0	0	0	0	1	0
	Pharmacotherapy-1	0	0	0	0	0	0	0	0
	Pharmacology-4	0	0	0	0	0	0	0	0
	Toxicology	0	1	0	0	0	0	0	0
	Pharmaceutical Biotechnology	0	0	0	0	0	0	0	0
	Basic Pharmacokinetics	0	0	0	0	0	0	0	0
	Dispensing of Medication	0	0	0	0	0	1	0	0
	Radiopharmacy	0	0	0	0	0	0	0	0
Year 4	Pharmacogenomics	0	0	0	0	0	1	1	0
	Biopharmaceutics	0	0	0	0	0	0	0	0
	Clinical Communication Skills	0	0	0	0	0	0	0	0
	Ethics in Pharmacy	0	0	0	0	0	0	0	0
	Pharmacotherapy-2	0	0	0	0	0	0	0	0
	Drug & Poison Information services & Liter		0	0	0	0	0	1	0
	Over the Counter Drugs Patient Assessment and First Aid	0	0	0	0	0	0	0	0
	Pharmacotherapy-3	0	0	0	0	0	0	0	0
	Pharmacotnerapy-3 Pharmacoeconomics & Epidemiology	0	0	0	0	0	0	0	0
	Pharmacy Management	0	0	0	0	0	0	0	0
	Evidence Based Pharmacy	0	0	0	0	0	0	1	0
	Pharmaceutical Care	0	0	0	0	0	0	0	0
	Applied Pharmacokinetics	0	0	0	0	0	1	0	0
Year 5	Clinical Nutrition & IV Adminsteration	0	0	0	0	0	0	0	0
	Pharmacy Law	0	0	0	0	0	0	0	0
	Scientific Writing and Seminar-2	0	0	0	0	0	0	0	0
	Drug of Abuse	0	0	0	1	0	0	0	0
	Pharmacotherapy-4	0	0	0	0	0	1	0	0

Table 6.10: Mapping of PPH behaviours with curriculum B by course and study year

				Ph	armaceutica	ıl Public He	alth		
Year		1. Emergen	cyresponse	2.1	Health promot	ion	3. Medicir	nes informatio	n & advice
	Course name	1.1	1.2	2.1	2.2	2.3	3.1	3.2	3.3
	English	0	0	0	0	0	0	0	0
	IT skills	0	0	0	0	0	0	0	1
	Fitness and health education	0	1	0	1	0	0	0	0
	University skills	0	0	0	0	0	0	0	0
Year 1	Biostatistics	0	0	0	0	0	0	0	0
	General zoology								
	Physics								
	Introduction to organic chemistry		_					_	
	English	0	0	0	0	0	0	0	0
	Pharmaceutical calculation	0	0	0	0	0	0	0	0
	The introductory pharmacy practice experience-1	0	0	0	0	0	0	0	0
	Pharmaceutical organic chemistry	0	0	0	0	0	0	0	0
	Anatomy Biochomistry 1	0	0	0	0	0	0	0	0
	Biochemistry-1	0	0	0	0	0	0	0	0
Year 2	Physiology-1								0
	Basics of natural products Pharamcutics-1	0	0	0	0	0	0	0	0
	Medicinal Chemistry-1	0	0	0	0	0	0	0	0
	Introduction to Pharmacy Profession	0	0	0	0	0	0	0	0
	Biochemistry-2	0	0	0	0	0	0	0	0
	Physiology-2	0	0	0	0	0	0	0	0
	Pharmaceutics-2	0	0	0	0	0	0	0	0
	Dietary Supplements	0	0	0	0	0	0	0	0
	The Introductory Pharmacy Practice Experience-2	0	0	0	0	0	1	0	0
	Pharmacy information Systems	0	0	0	0	0	0	1	0
	Medicinal Chemistry-II	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab-1	0	0	0	0	0	0	1	0
	Pharmacology-1	0	0	0	0	0	0	0	0
Year 3	The Introductory Pharmacy Practice Experience-3	0	0	0	0	0	1	0	0
	Pharmacy Practice lab-2	0	0	0	0	0	0	1	0
	Complementary and Alternative Medicine	0	0	0	0	0	0	0	0
	Drug Discovery	0	0	0	0	0	0	0	0
	General Immunology	0	0	0	0	0	0	0	0
	Pharmacology-II	0	0	0	0	0	0	0	0
	Introduction to Pathophysiology	0	0	0	0	0	0	0	0
	Pharmacy in Health System	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-1	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab-3	0	0	0	0	0	0	1	0
	Pathophysiology and Therapeutics-2	0	0	0	1	0	0	0	0
	Evidence-based Herbal Medicine	0	0	0	0	0	0	0	0
	Clinical Microbiology	0	0	0	0	0	0	0	0
	Pharmacology 3	0	0	0	0	0	0	0	0
Year 4	Biopharmaceutics and Pharmacokinetic	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-3	0	0	0	1	0	0	0	0
	Pharmacy Practice Lab-4	0	0	0	0	0	0	1	0
	Pathophysiology and Therapeutics-4	0	0	0	0	0	0	0	0
	Clinical Immunology	0	0	0	0	0	0	0	0
	Pharmaceutical Biotechnology	0	0	0	0	0	0	0	0
	Sterile & parenteral preparations	0	0	0	0	0	0	0	0
	Toxicology	0	1	0	0	0	0	0	0
	Pharmacy laws and Ethics	0	0	0	0	0	0	0	0
	Pharmacoeconomics	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-5	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab 5	0	0	0	0	0	0	0	0
	The Introductory Pharmacy Practice Experience-4	0	0	0	0	0	1	1	0
	Pathophysiology and Therapeutics-6		0		1		0	0	0
	Research design and Pharmacoepidemiology Medication Therapy Management-1	0	0	0	0	0	0	0	0
Year 5	Applied Pharmacokinetics	0	0	0	0	0	0	0	0
rear 5		0	0	0	0	0	0	0	0
	Pharmacy management and marketing Pathophysiology and Therapeutics-7	0	0	0	1	0	0	0	0
	n acrophysiology and inclapeutics-/					0	0	0	0
		0	l C	C C					
	Pathophysiology and Therapeutics-8	0	0	0	0				
	Pathophysiology and Therapeutics-8 Pharmacy Practice Lab-6	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-8								

6.5.3.3 PC cluster

Within the PC cluster (Table 6.11 and Table 6.12), the number of behavioural statements mapped with curricula from both schools curricula was highest in the "medicines" competency group (18.45%, 24.45%, respectively) followed by "compounding medicines" (7.29%, 9.23%, respectively). Behaviour 7.3 "Ensure appropriate medicines, route, time, dose, documentation, action, form and response for individual patients" under the "medicines" competency group had the most shading within all behaviours across both curricula (school A=18.02%, school B=24.45%). Behaviour 5.1 "Prepare pharmaceutical medicines (e.g. extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)" under the "compounding medicines" group acquired the second most intense shading within the PC cluster. Compared to other groups within the PC, competency groups of "dispensing" (school A=2.57%, school B= 4.34%) and "patient consultation" and diagnosis" appeared to receive less emphasis at the course level in both curricula (school A= 4.29%, school B= 5.97%). Compared to school A, school B curriculum shows less emphasis at the course level on "monitor medicines therapy" competency group compared to school A (school B= 4.89%, school A=5.57%

Table 6.11: Mapping of PC behaviours with curriculum A by course and study year.

														1	Pharm	aceu	tical C	are													
Ye ar		4.	Asses	smen	t of m	edicii	nes	Com di	o. poun ng icines			6	. Disp	ensin	g			7	7. Med	dicine	S	me	Moni edicin herap	es		9. Pa		consul	ltation sis	n and	
	Course name	4. 1	4. 2	4. 3	4. 4	4. 5	4. 6	5.1	5.2	6. 1	6. 2	6. 3	6. 4	6. 5	6. 6	6. 7	6. 8	7. 1	7. 2	7. 3	7. 4	8. 1	8. 2	8. 3	9. 1	9. 2	9. 3	9. 4	9. 5	9. 6	9. 7
	Medical terminology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mathematics for Pharmacy	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Human Biology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Organic Chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1	Human Anatomy and Histology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1	Introduction to Pharmacy Profession	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Biostatistics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Organic Chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Microbiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Analatical Chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biochemistry-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Physiology-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Phatmaceuutics-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacognosy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Computer for Health sciences	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
2	General Immunology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Biochemistry-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Physiology-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Medicinal Chemistry-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Molecular Pharmacology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutics-2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
3	Medicinal Chemistry-2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

														-	harm	aceut	tical C	are													
Ye ar		4.	Asses	smen	t of m	iedicii	nes	Com	5. poun ng icines			6	. Disp	ensin	g			7	'. Me	dicine	s	m	Moni edicin herap	es		9. Pa		consu	Iltatioi sis	n and	
	Course name	4.	4. 2	4.	4.	4.	4. 6	5.1	5.2	6. 1	6. 2	6. 3	6. 4	6. 5	6. 6	6. 7	6. 8	7. 1	7. 2	7. 3	7. 4	8. 1	8. 2	8. 3	9. 1	9. 2	9. 3	9. 4	9. 5	9. 6	9. 7
	Pathophysiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Chemotherapy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Natural Products Chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacopeial Analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicinal Chemistry-3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutics-3	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Scientific Writing and Seminar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacotherapy-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0
	Pharmacology-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0
	Toxicology	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0
	Pharmaceutical Biotechnology	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		-		0	0	0	0	1	0	0	0	0	0	0	0	1000	0	0	0	1	0	0	0	0	0	0	0	0			0
	Basic Pharmacokinetics	0	0	1	0		-	1	0	100	0	0	0	0		0	0	0	200	1		0	0	0	0	0	0	0	0	0	0
	Dispensing of Medication	-	0	-		0	0	1	-	1	0.000	0			1	1			0	0	0				1000			-		0	
-80	Radiopharmacy	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
4	Pharmacogenomics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Biopharmaceutics	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Clinical Communication Skills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ethics in Pharmacy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacotherapy-2 Drug & Poison Information services &	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0
	Literature Evaluation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Over the Counter Drugs	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	1	0	0	0	0
	Patient Assessment and First Aid	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1
5	Pharmacotherapy-3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0

														3	harm	aceu	tical C	are													
Ye ar		4.	Asses	smen	t of m	redici	nes	Com	5. Ipoun ing icines			€	i. Disp	ensin	g			7	7. Me	dicine	s	m	Moni edicir herap	ies		9. Pa	tient (consu		n and	
	Course name	4.	4.	4.	4. 4	4. 5	4. 6	5.1	5.2	6. 1	6. 2	6. 3	6. 4	6. 5	6. 6	6. 7	6. 8	7. 1	7. 2	7. 3	7. 4	8. 1	8. 2	8. 3	9. 1	9. 2	9. 3	9. 4	9. 5	9. 6	9. 7
	Pharmacoeconomics & Epidemiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Management	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Evidence Based Pharmacy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Care	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0
	Applied Pharmacokinetics	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0
	Clinical Nutrition & IV Adminsteration	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
	Pharmacy Law	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scientific Writing and Seminar-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Drug of Abuse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacotherapy-4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0
	Graduation Project	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6.12: Mapping of PC behaviours with curriculum B by course and study year

														F	harm	aceut	ical C	are				W.			av.						
Year		4.	Asses	smen:	t of m	edicir	nes		ound			6	i. Disp	ensin	g			7	'. Med	dicine	s	m	Monit edicin herap	es		9. Pa		consu agnos	ltation sis	1 and	
	Course name	4. 1	4. 2	4. 3	4. 4	4. 5	4. 6	5.1	5.2	6. 1	6. 2	6. 3	6. 4	6. 5	6. 6	6. 7	6. 8	7. 1	7. 2	7. 3	7. 4	8. 1	8. 2	8. 3	9. 1	9. 2	9. 3	9. 4	9. 5	9. 6	9. 7
	English	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	IT skills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fitness and health education	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University skills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year	Biostatistics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	General zoology	0 1	1 1		1	1	-		I	1 1		1	1	1 1	1 (1	l L	ı	1	1 1	ı	1 1	7 1	1	1 1		J 1	1 1	1 1	1 -	
	Physics)	-	=	0 -	-	=	_		1 1		0 -	1	7 1	0 -	1	1	- C	-	1	1			1	-	-)	-	=	-	-
	Introduction to organic chemistry	1 1		_	1 1	1.1	_	_		1 1	_	1 1	1.1	1 1	-	- 1	1 1	- 1	1 1	1 1	1 1	1 1	1	-	-	_	1 1	1 1	-	-	-
	English	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical calculation	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	The introductory pharmacy practice experience-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical organic chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Anatomy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Biochemistry-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Year 2	Physiology-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
87-21	Basics of natural products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharamoutics-1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
13	Medicinal Chemistry-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Introduction to Pharmacy Profession	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biochemistry-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

								7.						ı	harm	aceut	ical C	are													
Year		4.	Asses	smen	t of m	edicir	nes	Comp	oound oound ig icines			6	. Disp	ensin	g			7	7. Me	dicine	s	me	Monit edicin herap	es		9. Pa		consu	Itation sis	n and	
	Course name	4. 1	4. 2	4.	4. 4	4. 5	4. 6	5.1	5.2	6. 1	6. 2	6. 3	6. 4	6. 5	6. 6	6. 7	6. 8	7. 1	7. 2	7. 3	7. 4	8. 1	8. 2	8. 3	9. 1	9. 2	9. 3	9. 4	9. 5	9. 6	9. 7
	Physiology-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutics-2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Dietary Supplements	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	The Introductory Pharmacy Practice Experience-2	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	Pharmacy information Systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicinal Chemistry-II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab-1	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
Year	Pharmacology-1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
3	The Introductory Pharmacy Practice Experience-3	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	Pharmacy Practice lab-2	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
	Complementary and Alternative Medicine	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Drug Discovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	General Immunology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Introduction to Pathophysiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy in Health System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Pathophysiology and Therapeutics- 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Year	Pharmacy Practice Lab-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
4	Pathophysiology and Therapeutics- 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Evidence-based Herbal Medicine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Clinical Microbiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

														ı	harm	aceut	tical C	are													
Year		4.	Asses	smen	t of m	edicir	nes	Comp ir medi	ound			6	i. Disp	ensin	g			7	7. Me	dicine	s	m	Monit edicin herap	ies		9. Pa		consu agnos	ltatior sis	n and	
	6	4.	4.	4.	4. 4	4.	4. 6	5.1	5.2	6. 1	6. 2	6. 3	6. 4	6. 5	6. 6	6. 7	6. 8	7.	7. 2	7. 3	7. 4	8.	8. 2	8. 3	9. 1	9. 2	9. 3	9. 4	9. 5	9. 6	9.
3	Course name	1	9546.5	3					0.		150000	(0000)		30000	3-0400.	200		1				1		(0600)	-	-00000	Contract Con	705	- 100	3-300	7
	Pharmacology 3 Biopharmaceutics and	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacokinetic	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-																														
9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab-4	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
	Pathophysiology and Therapeutics- 4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0
	Clinical Immunology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Biotechnology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Sterile & parenteral preparations	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Toxicology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy laws and Ethics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacoeconomics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics- 5	1	0	0	0	0	0	0	0	0	o	0	0	0	o	0	0	0	0	1	0	0	1	0	0	0	0	o	o	0	0
	Pharmacy Practice Lab 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0	1	0	0
	The Introductory Pharmacy																-								-						
	Practice Experience-4 Pathophysiology and Therapeutics-	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Year	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
5	Research design and Pharmacoepidemiology	0	0	0	o	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	o	0	0	0	0	0	0	0	0	0	0
3	Medication Therapy Management-	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
8	Applied Pharmacokinetics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0
	Pharmacy management and		7721																	/wii				2000	71760						
	marketing Pathophysiology and Therapeutics-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

														1	harm	aceut	tical C	are													
Year		4.	Asses	smen	t of m	redicii	nes	Comp	oound ng icines			€	i. Disp	ensin	g			-	7. Me	dicine	s	m	Moni edicir herap	ies		9. Pa		consu		n and	
		4.	4.	4.	4.	4.	4.	5.1	5.2	6.	6.	6.	6.	6.	6.	6.	6.	7.	7.	7.	7.	8.	8.	8.	9.	9.	9.	9.	9.	9.	9.
	Course name	1	2	3	4	5	6	3.1	5.2	1	2	3	4	5	6	7	8	1	2	3	4	1	2	3	1	2	3	4	5	6	7
	Pathophysiology and Therapeutics- 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Project and Seminar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Drug Information/Literature evaluation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medication therapy management-2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0

6.5.3.4 OM cluster

Across the curricula of both schools, the OM cluster and its associated competencies received less emphasis at the course level compared to other clusters. Within the OM cluster (Table 6.13 and Table 6.14), the number of cells with shading had a similar low number of shadings across the competency groups (School A=6%, School B= 2.17%). The curricular map of school A appeared to have a slight but better-distributed emphasis on OM competencies (budget and reimbursement= 1.2%, human resources and management= 2.1%, improvement of service=0.85%, procurement=0.85%, supply chain and management=0.85%, workplace management=0) compared to school B with almost a lack of shadings in the OM competencies at the course level (budget and reimbursement= 0 human resources and management= 0.54%, improvement of service=0, procurement=1.63%, supply chain and management=0, workplace management=0)

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Table 6.13: Mapping of OM behaviours with curriculum A by course and study year

														Or	ganis	ation	and N	/lanag	emer	ıt								· · ·					
Y e		10. Budget & reimbursement					11. Human resources management					Improv of se	13. Procurement							14. Supply chain & management						15. Workplace management							
ar	Course name	1 0. 1	1 0. 2	1 0. 3	1 0. 4	1 0. 5	1 1. 1	1 1. 2	1 1. 3	1 1. 4	1 1. 5	12.1	12.2	1 3. 1	1 3. 2	3. 3.	1 3. 4	1 3. 5	3. 6	1 3. 7	1 4. 1	1 4. 2	1 4. 3	1 4. 4	4. 5	1 4. 6	1 4. 7	1 5. 1	1 5. 2	1 5. 3	1 5. 4	1 5. 5	1 5. 6
1	Medical terminology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mathematics for Pharmacy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Human Biology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Organic Chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Human Anatomy and Histology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Introduction to Pharmacy Profession	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biostatistics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Organic Chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Microbiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Analatical Chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Biochemistry-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physiology-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Phatmaceuutics-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacognosy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Computer for Health sciences	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	General Immunology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biochemistry-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Physiology-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicinal Chemistry-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Molecular Pharmacology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutics-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Medicinal Chemistry-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

														Or	ganisa	ation a	and M	lanag	emen	t													
Y e				Budg burse				mai	nan re nagen	esourc nent		100000000000000000000000000000000000000	2. /ement rvice			-01.11	ocure	ement				. Supp	oly ch	ain &	mana		esa son	3805,000			mana		
ar	Course name	1 0. 1	1 0. 2	1 0. 3	1 0. 4	1 0. 5	1 1. 1	1 1. 2	1 1. 3	1 1. 4	1 1. 5	12.1	12.2	1 3. 1	1 3. 2	1 3. 3	1 3. 4	1 3. 5	1 3. 6	1 3. 7	1 4. 1	1 4. 2	1 4. 3	1 4. 4	1 4. 5	1 4. 6	1 4. 7	1 5. 1	1 5. 2	1 5. 3	1 5. 4	1 5. 5	1 5. 6
	Pathophysiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chemotherapy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Natural Products Chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacopeial Analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicinal Chemistry-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutics-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scientific Writing and Seminar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacotherapy-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Toxicology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Biotechnology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Basic Pharmacokinetics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dispensing of Medication	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Radiopharmacy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Pharmacogenomics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biopharmaceutics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Clinical Communication Skills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ethics in Pharmacy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacotherapy-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Drug & Poison Information services & Literature Evaluation	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Over the Counter Drugs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

														Or	ganis	ation	and N	/lanag	emer	it													
Y e				Budg burse	et & ment		11	1. Hun mai	nan re nager		ces	1 Improv	/ement			13. P	rocure	ement	t		14	. Supp	ply ch	ain &	mana	agem	ent	15.	. Worl	kplace	e man	agem	ent
ar		1 0.	1 0.	1 0.	1 0.	1 0.	1 1.	1 1.	1 1.	1 1.	1 1.	12.1	12.2	1 3.	1 4.	1 5.	1 5.	1 5.	1 5.	1 5.	1 5.												
	Course name	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6
	Patient Assessment and First Aid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacotherapy-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacoeconomics & Epidemiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Management	0	1	0	1	0	1	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Evidence Based Pharmacy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Care	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Applied Pharmacokinetics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Clinical Nutrition & IV Adminsteration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Law	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scientific Writing and Seminar-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Drug of Abuse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacotherapy-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Graduation Project	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The complete shading in these tables indicates that the course did teach the behaviour in question and represented as (1) whereas the absence of shading indicates that the course did not teach the behaviour and represented as (0)

Table 6.14: Mapping of OM behaviours with curriculum B by course and study year

														Or	ganisa	ation :	and M	lanag	emen	t													
Ye ar				Budg burse	et & ment		11		nan re nagen	esourc nent	ces	The same of the same of the	2. vement rvice			13. Pr	rocure	ement	t		14	. Supp	oly ch	ain &	mana	igeme	ent	15.	Worl	kplace	e man	agem	ent
	Course name	1 0. 1	1 0. 2	1 0. 3	1 0. 4	1 0. 5	1 1. 1	1 1. 2	1 1. 3	1 1. 4	1 1. 5	12.1	12.2	1 3. 1	1 3. 2	1 3. 3	1 3. 4	1 3. 5	1 3. 6	1 3. 7	1 4. 1	1 4. 2	1 4. 3	1 4. 4	1 4. 5	1 4. 6	1 4. 7	1 5. 1	1 5. 2	1 5. 3	1 5. 4	1 5. 5	1 5. 6
	English	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	IT skills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fitness and health education	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V-	University skills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ye ar	Biostatistics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	General zoology	_	_	_	-		_	_	_		_	_	_	_	_	1	_	_	_	_	-	1 1	- 1	-24	1 1	_	_	_	1 1	1 1	_	_	_
	Physics	_	-	-	1-	1	_	_	_	_	_	Com 16	10,71,20	-	_	1	-	_	-	-14	ı	I	1	-2-6	L	-	_	1	T	1		_	424
	Introduction to organic chemistry	-	-	_	-	-	-	-	-	-	_			-			-	-	-		1	1 1	1 1		1 1	-	-	- 1	1 1		-	-	-
	English	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical calculation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	The introductory pharmacy practice experience-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical organic chemistry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Anatomy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ye	Biochemistry-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ar 2	Physiology-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(See)	Basics of natural products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharamcutics-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicinal Chemistry-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Introduction to Pharmacy Profession	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biochemistry-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Ye ar				Budg burse			11	L. Hun mai	nan re nagen		ces	1 Improv of se	ement			13. Pı	ocure	ement			14	. Supj	oly ch	ain &	mana	ageme	ent	15.	Worl	place	man	ageme	ent
	Course name	1 0. 1	1 0. 2	1 0. 3	1 0. 4	1 0. 5	1 1. 1	1 1. 2	1 1. 3	1 1. 4	1 1. 5	12.1	12.2	1 3. 1	1 3. 2	1 3. 3	1 3. 4	1 3. 5	1 3. 6	1 3. 7	1 4. 1	1 4. 2	1 4. 3	1 4. 4	1 4. 5	1 4. 6	1 4. 7	1 5. 1	1 5. 2	1 5. 3	1 5. 4	1 5. 5	1 5. 6
	Physiology-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutics-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dietary Supplements	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	The Introductory Pharmacy Practice Experience-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy information Systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicinal Chemistry-II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ye	Pharmacology-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ar 3	The Introductory Pharmacy Practice Experience-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice lab-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Complementary and Alternative Medicine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Drug Discovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	General Immunology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology-II	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Introduction to Pathophysiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy in Health System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ye ar	Pathophysiology and Therapeutics-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Pharmacy Practice Lab-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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		1 0.	1 0.	1 0.	1 0.	1 0.	1 1.	1 1.	1 1.	1 1.	1 1.	12.1	12.2	1 3.	1 4.	1 5.	1 5.	1 5.	1 5.	1 5.	1 5.												
	Course name	1	2	3	4	5	1	2	3	4	5		304-14-0	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6
	Evidence-based Herbal																																
	Medicine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Clinical Microbiology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacology 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biopharmaceutics and Pharmacokinetic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Clinical Immunology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmaceutical Biotechnology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sterile & parenteral preparations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Toxicology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy laws and Ethics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacoeconomics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V-	The Introductory	Ī	_	13							100			100	-		-		- 10-				-						-		- 1. 2 1		
Ye ar	Pharmacy Practice Experience-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Pathophysiology and Therapeutics-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Research design and																																
	Pharmacoepidemiology Medication Therapy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Management-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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		1 0.	1 0.	1 0.	1 0.	1 0.	1 1.	1 1.	1 1.	1 1.	1 1.	12.1	12.2	1 3.	1 4.	1 5.	1 5.	1 5.	1 5.	1 5.	1 5.												
	Course name	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6
	Applied Pharmacokinetics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy management and marketing	0	o	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pathophysiology and Therapeutics-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pharmacy Practice Lab-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Project and Seminar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Drug Information/Literature evaluation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medication therapy management-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The complete shading in these tables indicates that the course did teach the behaviour in question and represented as (1) whereas the absence of shading indicates that the course did not teach the behaviour and represented as (0

6.5.3.5 PP cluster

Within the PP cluster (Table 6.15 and Table 6.16), the number of behavioural statements mapped with curricula was highest in "quality assurance and research in workplace" competency in both curricula (school A=15.02%, school B=12.50%). Within "quality assurance and research in workplace" competency, the highest count of behavioural statements mapped with curriculum in school A was for behaviour 23.5 "Ensure medicines are not counterfeit and adhere to quality standards" (5.15%) whereas in school B it was for behaviour 23.6 "Identify and evaluate evidence-base to improve the use of medicines and services" (4.89%).

Under the "communication skills" competency, behaviour 16.2 "Communicate effectively with health and social care staff, support staff, patients, carer, family relatives and clients/customers, using lay terms and checking understanding" appeared to receive the second-highest number of shadings in both curricula followed by 16.4" Use appropriate communication skills (e.g. verbal and non-verbal) to establish and maintain rapport with the patient and others including when communicating through digital and electronic platforms" in school A and behaviour 21.6 "Engage with health and medicines policies" in school B. Competency groups of "leadership and self-regulation" and "CPD" appeared to receive the lowest emphasis at the course level compared to other groups within the PP cluster in curriculum A (0%, 2.57%, respectively) and curriculum B (0%, 0.54%, respectively).

Table 6.15: Mapping of PP behaviours with curriculum A by course and study year

Υ																									F	rofes	siona	al/Per	sona	ı																							
e a		Ca	16 mmu n sk	nicatio	0				inuing elopme			nal				igital racy			terpr			ı	20	. Lea	dersh	ip&s	self-re	gulati	on		21		al & r		tory		22	. Pro	fessi	onal :	and e	thical	pract	tice		23.	Qualit			e and	l resea	arch ir	1
r	Course	1 6	1 6			7		7	1 1		7	7	7		8	1 8	1 8	9	9	9	1 9	9	0	0	0	2 0	0	2 2			1	1	1	1	2	2	2 2	2 2	2 2	2 2	2	2 2	2 2	2	2 :	3			3	3	3		3
\vdash	name Medica	1	2	3	4	1	2	3	4 5	6	7	8	9	1	2	3	4	1	2	3	4	5	1	2	3	4	5	6 7	8	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	1	2 3		5	6	7		9
	l termin ology	ō	1	0	0	0 1	0	0 1	o c	0	0	0	0	0	0	0	0	Ö	0	0	0	0	0	0	0	0	0	0 0) () 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 1	0	5 0	0	0	0	0	0	0
	Mathe matics for Pharm acy	0	0	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0) () 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 1	0	o c) 0	0	0	0	0	0
	Human Biology	0	0	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0) (0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0	0	ō	0
	Organi c Chemis try	0	0	0	0	0	0	0 1	o c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0) () 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 1	0	o 0) 0	0	0	0	0	0
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	stics Pharm	0	0	0	0	0	0	0	0 C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0) (0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0	0	1	0	0	0
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Course	1 6	6	6	6	1 7	1 7	1 7	1 7	7	1 7	1 7	1 7	1 7	8	8		- 1	9	9 :	9 !	9 9	9 0	0			0	0	2 0	0	1	1	2 2 1 1	1 .	1	1	2 2 .	2	2 2	2 2 .	2		2	2	2	3	3	3 3		3 3	3	3 .	
name mistry- 1	1	2	3	4	1	2	3	4	5	6	7	8	9	1	2	3	4	1	2	3 4	4 !	5 1	1 2	3	4	5	6	7	8	1	2	3 4	5	6	7	1	2	3	4	5	6	7	8	9	1	2	3 4	4 !	5 6	7	7 8	1000
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100		6	6	6	6	7	7	8	7 7	1 3	7	7	7	7	7	8	8	8	8	9	9	1 :	9 !	9	9	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	. 2	2	2	2	2	2	2	2	2	2	1 5	3	3	3 3	3 5	3	3	3	: 5
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The complete shading in these tables indicates that the course did teach the behaviour in question and represented as (1) whereas the absence of shading indicates that the course did not teach the behaviour and represented as (0)

Table 6.16: Mapping of PP behaviours with curriculum B by course and study year

Γ																										Profes	siona	al/Pe	rsona	al																						
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F	n	ame nglis	1 2	2 3	4	1	2	3 4	5	6	7	8	9	1	2	3	4	1		3	4	5	1	2	3	4	5 (6	7	8	1 2	3	4	5	6	7	1	2	3	4	5	6 7					3	4	5	6	7	8 9
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1	in Y under plant me procession of the procession	xperi nce-	0 3	1 0	0	0	0	0 () 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0	0	0 1	0 0) 0	0	0	1	0	0	0	0	0	0	0 () (c) 0	0	0	0	0	0	0	0	0 0
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Drug Infor matio n/Lite rature evalu ation) 0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	. 0	0 (0 (0	0	0	0	0	0	0	0	0	1	0	C	
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The complete shading in these tables indicates that the course did teach the behaviour in question and represented as (1) whereas the absence of shading indicates that the course did not teach the behaviour and represented as (0)

6.5.4 Map of sampled curricula to the competency framework by course and subject domain

The curricular maps in Table 6.17 and Table 6.18 show that courses within the PRAC subject domain appeared to contribute more to the accomplishment of all competencies in both school curricula.

Table 6.17: Map of curriculum A to competency clusters of the proposed national competency framework by course and subject domain

Domain	Course name	PPH	PC	ОМ	PP	Total counts per subject domain
MATH	Mathematics for Pharmacy	0	1	0	0	1 (0.39%)
	Medical terminology	0	0	0	1	
	Computer for Health sciences	1	1	0	3	24 (9.56%)
	Scientific Writing and Seminar	1	1	0	3	
GEN	Clinical Communication Skills	0	0	0	3	
	Scientific Writing and Seminar-2	0	0	0	4	
	Graduation Project	0	0	0	6	
	Human Biology	0	1	0	0	
	Biostatistics	0	0	0	1	15 (5.97%)
	Pharmaceutical Microbiology	1	1	0	0	, ,
BIO	Chemotherapy	0	1	0	0	
	Pharmaceutical Biotechnology	0	2	0	2	
	Pharmacogenomics	2	3	0	1	
	Phatmaceutics-1	0	2	0	2	
	Pharmaceutics-2	0	2	0	1	34 (13.54%)
	Pharmaceutics-3	0	3	0	2	(2 2 11)
PHAR	Toxicology	1	5	0	0	
	Basic Pharmacokinetics	0	2	0	0	
	Biopharmaceutics	0	2	0	1	
	Applied Pharmacokinetics	1	7	0	3	
	Organic Chemistry	0	1	0	0	
	-			0		
	Pharmaceutical Organic Chemistry Pharmaceutical Application Chemistry	0	0	0	2	14 (5.57%)
	Pharmaceutical Analatical Chemistry	0			0	
CHEM	Biochemistry-1	0	1	0		
	Biochemistry-2	0	1	0	3	
	Natural Products Chemistry		1			
	Pharmacopeial Analysis	0	0	0	2	
	Radiopharmacy	0	2	0	0	
	Introduction to Pharmacy Profession	1	3	0	6	
	Pharmacy Practice Pharmacotherapy-1	0	6	0	6	
	•		7	0	1	
	Dispensing of Medication	0	0		1	424/40 4000
	Ethics in Pharmacy Pharmacotherapy-2	0	3	0	4	124 (49.40%)
PRAC	•					
	Drug & Poison Information services & Literature Evaluation	1	1	2	3	
	Pharmacotherapy 2	0	5 4	0	0	
	Pharmacotherapy-3 Pharmacoeconomics & Epidemiology	0	0	0	7	
	Pharmacy Management	0	0	8	1	
	Evidence Based Pharmacy	1	1	0	4	
	Pharmaceutical Care	0	4	2	2	

Domain	Course name	PPH	PC	ОМ	PP	Total counts per subject domain
	Clinical Nutrition & IV Adminsteration	0	5	0	2	
	Pharmacy Law	0	0	0	5	
	Pharmacotherapy-4	1	5	0	4	
	Human Anatomy and Histology	0	1	0	0	
	Physiology-1	0	1	0	0	
	Pharmacognosy	0	1	0	3	
	General Immunology	0	1	0	0	
	Physiology-2	0	1	0	0	
	Medicinal Chemistry-1	0	2	0	1	39 (15.53%)
	Pharmacology-1	0	1	0	0	33 (23.337,0)
	Molecular Pharmacology	0	1	0	0	
MED	Medicinal Chemistry-2	0	2	0	1	
	Pathophysiology	0	1	0	0	
	Pharmacology-2	0	2	0	0	
	Medicinal Chemistry-3	0	2	0	1	
	Pathophysiology-2	0	1	0	0	
	Pharmacology-3	0	1	0	0	
	Pharmacology-4	0	2	0	0	
	Over the Counter Drugs	1	8	0	1	
	Drug of Abuse	1	1	0	1	and the same halo at a second

In the table, the value (0) indicates that the course learning outcomes or course descriptions did not match any behavioural statement of the proposed competency framework. In cases where course learning outcomes or course descriptions matched more than one behavioural statement, the response was recorded as (1) for all matching behaviours. As a result, the degree of intensity of shading in these tables is proportionate to number of behaviours.

Table 6.18: Map of curriculum B to competency clusters of the proposed national competency framework by course and subject domain

Domain	Course name	PPH	PC	ОМ	PP	Total counts per subject domain
МАТН	Physics	_	_			No counts due to lack of information
	English	0	0	0	1	
	IT skills	1	0	0	2	
O.E.N.	Fitness and health education	2	0	0	0	11 (5.97%)
GEN	English	0	0	0	1	
	Project and Seminar	0	0	0	3	
	University skills	0	0	0	1	
	Biostatistics	0	0	0	1	
nio.	General zoology		_			
BIO	Clinical Microbiology	0	1	0	0	3 (1.63%)
	Pharmaceutical Biotechnology	0	1	0	0	
	Pharmaceutical calculation	0	1	0	0	
	Pharamcutics-1	0	2	0	1	
	Pharmaceutics-2	0	2	0	2	22 (11.95%)
PHAR	Biopharmaceutics and Pharmacokinetic	0	5	0	0	
	Sterile & parenteral preparations	0	3	0	1	
	Toxicology	1	1	0	0	
	Applied Pharmacokinetics	0	3	0	0	
	Introduction to organic chemistry	_	_			
	Pharmaceutical organic chemistry	0	1	0	0	
СНЕМ	Biochemistry-1	0	1	0	0	4 (2.17%)
	Biochemistry-2	0	1	0	0	
	Drug Discovery	0	1	0	0	
	The introductory pharmacy practice experience-1	0	0	0	2	
	Introduction to Pharmacy Profession	0	0	0	2	
	The Introductory Pharmacy Practice Experience-2	1	6	1	2	
	Pharmacy information Systems	1	0	0	0	
	Pharmacy Practice Lab-1	1	6	0	2	100 (54.34%)
	The Introductory Pharmacy Practice Experience-3	1	6	1	1	
	Pharmacy Practice lab-2	1	6	0	2	
	Pharmacy in Health System	0	0	0	1	
PRAC	Pharmacy Practice Lab-3	1	2	0	3	
	Pharmacy Practice Lab-4	1	6	0	2	
	Pharmacy laws and Ethics	0	0	0	3	
	Pharmacoeconomics	0	0	0	3	
	Pathophysiology and Therapeutics-5	0	3	0	0	
	Pharmacy Practice Lab 5	0	5	0	0	
	The Introductory Pharmacy Practice Experience-4	2	5	1	2	
	Research design and Pharmacoepidemiology	0	0	0	4	
	Medication Therapy Management-1	1	3	0	0	

Domain	Course name	PPH	PC	ОМ	PP	Total counts per subject domain
	Pharmacy management and marketing	0	0	1	1	
	Pharmacy Practice Lab-6	0	0	0	2	
	Drug Information/Literature evaluation	1	0	0	1	
	Medication therapy management-2	1	3	0	0	
	Anatomy	0	1	0	0	
	Physiology-1	0	1	0	0	
	Basics of natural products	0	1	0	1	
	Medicinal Chemistry-1	0	1	0	0	44 (22 249)
	Physiology-2	0	1	0	0	44 (23.91%)
	Dietary Supplements	0	1	0	0	
	Medicinal Chemistry-II	0	1	0	0	
	Pharmacology-1	0	2	0	0	
	Complementary and Alternative Medicine	0	2	0	2	
	General Immunology	0	1	0	0	
MED	Pharmacology-II	0	1	0	0	
IVIED	Introduction to Pathophysiology	0	1	0	0	
	Pathophysiology and Therapeutics-1	0	1	0	0	
	Pathophysiology and Therapeutics-2	1	1	0	1	
	Evidence-based Herbal Medicine	0	1	0	3	
	Pharmacology-3	0	2	0	0	
	Pathophysiology and Therapeutics-3	1	1	0	1	
	Pathophysiology and Therapeutics-4	0	4	0	0	
	Clinical Immunology	0	1	0	0	
	Pathophysiology and Therapeutics-6	1	1	0	1	
	Pathophysiology and Therapeutics-7	1	1	0	1	
	Pathophysiology and Therapeutics-8	1	1	0	1	

In the table, the value (0) indicates that the course learning outcomes or course descriptions did not match any behavioural statement of the proposed competency framework. In cases where course learning outcomes or course descriptions matched more than one behavioural statement, the response was recorded as (1) for all matching behaviours. As a result, the degree of intensity of shading in these tables is proportionate to number of behaviours.

At the level of competency cluster, the graphical map showed that the number of behavioural statements from the PPH cluster and its related competencies mapped with curricula appeared to be the highest in courses within the PRAC subject domains in both curricula (school A= 49.40%, school B=54.34%), such as Pharmacy practice and Medicine information courses. In school A, the emphasis on PPH appeared to be higher in courses within BIO, GEN and MED domains, whereas in school B the emphasis on PPH appeared in courses within MED and PHARM domains.

The number of behavioural statements from the PC cluster mapped with curricula appeared to be darker in courses within the PRAC domain (such as Pharmacy practice/Clinical training, Pharmacotherapy/Pharmaceutical care and Medication Therapy Management) followed by courses within MED (such as Biotechnology and Microbiology) and PHAR (such as Pharmacokinetics and Drug formulation) subject domains in both curricula.

The number of behavioural statements of the OM cluster and its related competencies mapped with curricula appeared to be in the PRAC domain only in both curricula, namely, pharmacy management courses.

The PP cluster and its associated competencies in both curricula appeared to receive a higher number of behavioural statements mapped with curricula within the PRAC domain such as Pharmacy law, Ethics, Pharmacoeconomics, Epidemiology, Clinical pharmacy and Pharmacy practice courses. Courses in the GEN domain also contributed to the accomplishment of the PP cluster in both curricula, including the Graduation research project, Communication and transferrable skills, Computer science and Computer skills courses.

At the level of competency groups, the graphical maps showed that the "medicines" competency group appeared to receive the highest emphasis from all curricular domains, except the GEN domain in the two curricula. The high emphasis on the

accomplishment of the "medicines" competency group appeared to be mainly from the BIO, CHEM and MED domains.

In both curricula, the courses within the GEN domain appeared to contribute highly to the accomplishment of "communication skills", "quality assurance and research in workplace" and "digital literacy" competency groups across all competencies of the competency framework.

Within the PHAR domain courses in both curricula, the emphasis appeared to be the highest on the "medicines", "compounding of medicines" and "quality assurance and research in workplace" competency groups.

Within the PRAC domain courses, a variation appeared in the emphasis on the accomplishment of competencies across the two school curricula. In curriculum A, courses from the PRAC domain appeared to contribute to the accomplishment of "legal and regulatory practice", followed by "monitor medicines therapy", "communication skills" and "medicines". In contrast, for curriculum B, the most accomplished competencies by courses from the PRAC domain were "medicines information and advice" and "compounding medicines", followed by "medicines", "patient consultations and diagnosis" and "legal and regulatory practice" competency groups.

6.6 Discussion

To our knowledge, this is the first study to assess curricular content of undergraduate PharmD programmes in Saudi Arabia. This study used a curriculum mapping approach to provide insight into the status of pharmacy education by evaluating the extent to which the curricular content of two educational programmes having different accreditation status and establishment years, included the competencies identified previously in Chapter 5 as required for effective professional performance. The curricular maps were based on the intended curricula from the sampled programmes where the teaching of a competency served as a proxy to assess the coverage within the curriculum. This approach has been applied successfully in several health and pharmacy-related education studies to provide insights into the curricula' strengths and weaknesses consequently offering opportunities to improve the quality of education (Litaker et al., 2004; Plaza et al., 2007; Kelley et al., 2008; Gmeiner et al., 2017; Wachtler and Troein, 2003; Ramia et al., 2016).

The curricular maps showed that most competencies identified in the proposed national competency framework were present in the sampled curricula. The distribution of competencies appeared to be greater in later years of both programmes, probably related to the higher intensity of clinical sciences and practical experience in the advanced years. The focus of the curricula was mainly on the basic and physical sciences in the early years, as reflected in other research (Kheir et al., 2008; Albekairy et al., 2021).

At the level of curricular weighting and trends, there was a variation in the proportion and in the orientation of the total curricular time (i.e. contact hours) between the two curricula. Despite both being a PharmD programme, curriculum A tends to be more physical sciences focused, while curriculum B is more practice-focused. While Al-jedai et al (2016) and Badreldin et al (2020) described local PharmD curricula as rich with pharmacy practice and clinical pharmacy-oriented didactic courses to prepare clinically oriented graduates, the study findings indicate that the instructional content of curriculum A was more like a BPharm degree in

reality rather than a PharmD. The findings regarding curriculum A reflect those of Almeman and Al-jedai (2016) who described this as a major issue of pharmacy education in Saudi Arabia whereby the structure and the content of PharmD and BPharm curricula in most pharmacy schools are similar with no significant differences in terms of general content or clinical orientation. Importantly, the inconsistency found in this study between the programme name and instructional content within one curriculum raises questions about the integrity of the curriculum, whether the content was evaluated and validated by the school upon programme establishment and whether regular assessment to assure content quality throughout the years exists (International Pharmaceutical Federation, 2014). This is an important issue for future research to investigate. However, as the number of pharmacy schools in Saudi Arabia transforming to PharmD is increasing (Al-jedai et al., 2016; Alhamoudi and Alnattah, 2018), these findings raise concerns about the strategy and the standards pharmacy schools are using to guide their transformation from BPharm to PharmD, especially if most schools are adopting similar programme syllabi and imitating each other (Almeman and Al-jedai, 2016). If this is indeed the case, the transformation to a PharmD degree to address the country's need for pharmacists qualified with clinical skills to perform the new services in community pharmacy might not be real, effective or of high quality.

Despite the variation between the two curricula regarding the proportion and the orientation of curricular subject domains, there is a similarity in terms of the emphasis on competencies. At the level of competency clusters, the OM and PPH clusters and associated competencies were the least emphasised, while PC and PP were the most emphasised in the two curricula graphical maps.

Regarding the OM cluster, both curricula lacked most competencies within the OM cluster until late in the programme. This maybe explains the early findings from the national survey about perceived low relevance of these competencies to pharmacists (Chapter 5), as well as support the findings from other research that pharmacists receive little or no training on these competencies in their undergraduate education (Al-Arifi, 2013). Unlike the OM cluster, the level of

coverage of the PPH, PC and PP clusters and their associated competencies by course sequence and year in the two programmes appeared to be better and increased throughout the programme.

Considering the competencies of the other three clusters, there is more emphasis on the technical aspects compared to professional practice. For example, the graphical maps showed the highest curricular emphasis on "medicines information and advice" from the PPH, "medicines" and "compounding of medicines" from the PC, "quality assurance and research in the workplace" and "communication skills" from the PP, with the least emphasis on "health promotion" from the PPH cluster, "dispensing" and "patient consultation and diagnosis" from the PC and "leadership and self-regulation" and "CPD" from the PP. This unbalanced emphasis indicates that the sampled curricula are yet product-oriented, which is contrary to the claim of Asiri (2011) that current pharmacy academic systems in Saudi Arabia are adopting a more patient-centred PharmD curriculum.

At the level of curricular domains within the sampled curricula, the graphical maps showed that courses within the PRAC subject domain contributed more to the accomplishment of all competencies in both curricula. However, the focus of the courses within PRAC on the accomplishment of the competencies varied between the two curricula. In curriculum A, the PRAC courses contributed to the accomplishment of "legal and regulatory practice", "monitor medicines therapy", "communication skills" and "medicines"; whereas in curriculum B, the most accomplished competencies were "medicines information and advice", "compounding medicines" and "medicines" competency groups. This variation in the emphasis on competencies for courses within the PRAC domain may reflect the school's understanding of practice requirements and potential future roles rather than on the national needs from pharmaceutical services and pharmacists' roles. Such an issue could have been overcome by the existence and utilisation of an evidence based national competency framework that is built on the needs of the practice to work as an overarching guide by schools to standardise competencies

required for graduates to achieve from initial education (International Pharmaceutical Federation, 2014).

The findings suggest potential imbalances and gaps in teaching the competencies required for effective professional performance in initial education throughout the sampled programmes. Acquiring the required competencies requires the curricula to be competency-based, whereby a balanced and wide range of required competencies are instilled in sequenced milestones to allow students' gradual progression toward competence as the curriculum advances (Pearson and Hubball, 2012; Koster et al., 2017). The provision of the expanded pharmaceutical services as per the 2030 Vision requires the parallel change of competency standards for graduates in initial education towards knowing and applying the principles surrounding the activities to manage drug therapy and optimise patients' quality of life (Wiedenmayer et al., 2006; Van Mil et al., 2004). This dictates pharmacy curricula to incorporate not only foundation scientific knowledge of medicinal products but also to strengthen several domains of skills and knowledge of implementing pharmaceutical care processes to provide quality and effective care services (Awaisu and Mottram, 2018). This means incorporating a balanced and wide mix of core competencies, including knowledge base and skills, to optimise patients' medicines-related needs such as patient assessment, laboratory data interpretation, drug monitoring as well as interviewing skills, communication skills and documentation skills (Awaisu and Mottram, 2018). In this way, the enacted competencies of pharmacy education will match the functions and responsibilities of a pharmacist as appropriate to the country's needs for effective pharmaceutical services in community settings.

6.6.1 Implications

After validation, the proposed national competency framework could be used as an evidence-based developmental guide to bridge the currently existing gaps reported in this study between initial education and real practice, through informing the development of consistent and quality competency based undergraduate and post-graduate education. To enable seamless progression from initial education through

foundation level to advanced and specialised practice, pharmacy schools and CPD providers could use the proposed competency framework in developing the curricula, both of the didactic and experiential components, as well as CPD activities and CE programmes to overcome the competency gaps reported in this study. Importantly and contrary to other research (Almeman and Al-jedai, 2016), this study does not advocate for developing a "one size fits all" curriculum as a means to enhance the quality of pharmacy education outcomes in Saudi Arabia. Rather, it calls for the adoption of the proposed competency framework by schools as an overarching guide to develop their expected programme outcomes (International Pharmaceutical Federation, 2014). In this way, consistent quality pharmacy education to attain and maintain pharmacists' competence to practise based on national healthcare and pharmacy practice needs will be ensured.

The methods employed in this study illustrated how mapping an educational curricula with the national competency framework can be used to provide insights into the programmes' strengths and weaknesses, as well as offer opportunities to enhance the quality of pharmacy education within a specific context (Kelley et al., 2008). For example, schools can use such graphical maps to identify potential redundancies, omissions or hidden parts of the curriculum; curriculum committees can use these maps as a baseline for curriculum revision processes; faculty members can use the maps as a data source to plan how potential deficiencies in the curriculum can be addressed and improved.

6.6.2 Limitations

Due to the type and method of data collected, this phase of the study has some limitations. The sample of two PharmD curricula does not represent the overall pharmacy education curricula in Saudi Arabia. The findings, therefore, are not inclusive or generalisable but insights might be transferable to improve pharmacy education in Saudi Arabia. The utilisation of the intended curricula in this study may have not provided a comprehensive curricular evaluation. Ideally, a comprehensive curricular evaluation should involve three aspects, the intended curriculum (as described in the programme handbook), the received curriculum (as perceived by

students or graduates) and the delivered curriculum (as perceived by faculty members). However, evaluating received and taught curriculum is susceptible to some limitations too, such as social desirability bias and recall bias (Plaza et al., 2007). Another limitation of using intended curriculum is that it does not provide a measure to determine the extent of the relative emphasis on each competency within each course in the curricula, i.e. proportions. Moreover, while intended and delivered curricula are assumed to be the same, the study findings represent the intended curricula described in the programme handbook, which may not be the same as that delivered in reality. As course descriptions were the only information provided from school B on their intended curriculum, this might have limited the depth and breadth required for a thorough instructional content evaluation of a curriculum. Due to the lack of data about the experiential portion of curriculum B, the decision was made not to map this in both curricula. If it had been mapped, the findings might reveal gaps in competencies from the didactic portion that might have been covered in the experiential portion of the curriculum. However, if such information were available, assessment of the relative experience of the different students would be difficult as it would be variable, especially as this training was not under direct supervision or school control. To ensure the consistency of the mapping process, I conducted the mapping process initially and then reviewed the mapping findings with my research supervisors at multiple points to ensure the reliability of the findings. Nonetheless, mapping using qualitative data is a subjective process, therefore, the results should be interpreted with caution.

6.7 Conclusion

This study evaluated two undergraduate PharmD programmes in Saudi Arabia as a case study using a curriculum mapping approach. Curricular maps provided a snapshot of the links between the curricular content of the sampled educational programmes and the competencies of the proposed national competency framework. Importantly, from a practice perspective, the study showed an unbalanced emphasis on some competencies of the "pharmaceutical care" cluster from the proposed competency framework compared to other clusters and their associated competencies. This suggests that current educational programmes might

not prepare the students sufficiently to provide the full range of quality pharmaceutical services as per the country's pharmacy practice needs. The proposed competency framework can be used to inform curriculum development to be competency-based, equipping students with the appropriate mix of core competencies required to deliver the required pharmaceutical services to best meet societal health needs and expectations.

Chapter 7: Final discussion and conclusion

7.1 Introduction

This chapter presents a summary and an integration of the key findings obtained from the three study phases to address the research questions outlined in Chapter 2 (section 2.8). This chapter also relates the study findings to the wider literature and discusses their implications for pharmacy education, practice, and policy in Saudi Arabia. Finally, the chapter concludes with the study's strengths and limitations and offers suggestions for future research.

7.2 Key findings from the three phases of the study

The overall research aim was to explore the extent to which pharmacy education can prepare competent pharmacists to address the healthcare needs for pharmacy practice in Saudi Arabia. For this, an exploratory sequential mixed-method research design was adopted and three objectives following the FIP needs-based education model were developed (Chapter 2, Table 2.6). First, the societal healthcare needs of pharmaceutical services were explored, then the competencies required to fulfil these services were identified and the ability of education to qualify graduates with these competencies was assessed. This study addressed the three objectives, therefore, the following section presents an integration of the three research phases relating the key findings of each phase with each other to better understand and validate the conclusions about the status of pharmacy education to develop high-quality and competency-based pharmacy education in Saudi Arabia.

7.2.1 Societal healthcare needs that can benefit from pharmacists' services in Saudi Arabia

Phase 1 (Chapter 4) addressed the first research question: "What are the country's needs for qualified pharmacists and pharmaceutical services?" The findings revealed that pharmacy policymakers, pharmacists and the general public perceive the country's need for pharmacists is to provide healthcare services in community pharmacies in order to optimise the health system capacity and increase access to primary care services and medicines expertise. The position of community

pharmacists as the most accessible healthcare professional in primary healthcare settings qualify them to contribute effectively in several preventive and public health services (Udoh et al., 2020). Several services were identified that were believed could maximise the health system's responsiveness to the growing and ageing population, as well as the transforming health system, namely health promotion and disease prevention, minor illness consultations and management and monitoring of NCDs.

The quantitative findings from the phase 2a national survey of pharmacists contributed to our understanding of pharmacists' current practices and shed light on services delivered by pharmacists in practice but not reported in the literature or governmental guidelines. A notable example is that health promotion and education by pharmacists were reported by Almeman and Al-jedai (2016) as not common practice for pharmacists in Saudi Arabia, and if provided, it is mainly through some hospital pharmacists via public health awareness campaigns, for example on national and international disease awareness days in shopping malls, hospitals or schools. However, the phase 2a findings added to the increasing body of knowledge that within the Saudi pharmacy practice environment, pharmacists are routinely involved in health promotion activities, medicines information and advice. The respondents from different practice settings perceived "health promotion" and "medicines information and advice" competencies under the PPH cluster as the most relevant to their practice compared to other competencies. Indeed, the pharmacists from DPC roles as well as NDPC roles showed a higher relevance to the PPH cluster compared to other clusters in the national survey. While these findings could represent those completed the survey, which were largely male, non-Saudis, working in DPC settings, they highlight that pharmacists in Saudi Arabia are not only routinely involved in pharmaceutical public health activities but also endorse the phase 1 findings that there is an existing desire and/or a growing need for these services as reflected by the high relevance of these competencies to pharmacy practice. Furthermore, the findings underscore the key role that pharmacists currently play in access to and delivery of primary healthcare and medicines expertise to the local community as well as the need to regulate such activities and instil and develop pharmacists' competencies to deliver these services effectively to ultimately improve the overall national health.

Detailed medication counselling during medication dispensing was reported by public and professionals as an unmet need and the general lack of detailed medication counselling and effective communication and engagement during medication dispensing by pharmacists was highlighted, both in hospitals and community pharmacies. In fact, it was reported by the professional and public respondents as a key reason of their dissatisfaction with pharmacists' services overall. This finding contradicted the phase 2a findings that illustrate that "medication counselling and advice", "communication skills", and "dispensing" competencies are the most relevant to the practice of the responding pharmacists. Nevertheless, the lack of detailed medication counselling and effective engagement and interaction of pharmacists with patients has been previously reported many times (Almansour et al., 2020a; Almansour et al., 2020b; Alrasheedy et al., 2017; Almeman and Al-jedai, 2016; Al-jedai et al., 2016; Albabtain et al., 2021). It is possible that the contradiction noted between phase 1 and phase 2a reflects the different perspectives of the respondents regarding these competencies. That is, the pharmacists may consider that their current practice of providing short and quick medication instructions during medication dispensing is meeting the requirement, while in reality, this practice was perceived as not sufficient and not meeting the respondents' needs and expectations for detailed and tailored advice regarding safe and rational use of their medications including use, contraindications, storage, and side effects. This perhaps prompted the public respondents in phase 1 to express their need for pharmacists to interact and communicate with them effectively for a better service and detailed medication information. This also further underscores the need for pharmacists to be aware of these needs, i.e., effective medication counselling and advice using appropriate communication skills during dispensing services and highlight the key role that initial pharmacy education and CPD play to enable pre-service and in-service pharmacists to effectively and efficiently deliver these services to meet patients' needs and expectations.

7.2.2 The competencies required for pharmacists to address the required healthcare needs

Examining the relevance of the FIP GbCF to the Saudi pharmacy practice environment (phase 2a) and developing a national profession-wide competency framework (phase 2b) addressed the second research question: "What are the competencies considered essential for pharmacists to address the required healthcare needs and pharmaceutical services in Saudi Arabia?"

In consultation with local pharmacy practitioners and pharmacy experts, phases 2a and 2b assessed the relevance of the FIP GbCF v1 to identify the required competencies and then adapted the FIP GbCF v2 to develop the first national competency framework for foundation-level pharmacists in Saudi Arabia. The national survey of pharmacists in phase 2a found that most of the behaviours included in the FIP GbCF v1 are relevant to pharmacists' practice but that several behaviours, mostly from the OM, PC and PP clusters, require modification to be appropriate for the local needs of Saudi pharmacy practice. The NGT with pharmacy experts in phase 2b used the findings from phase 2a and the FIP GbCF v2 as a base to develop a profession-wide consensus on 23 core competencies and 125 associated behavioural statements required of pharmacists to address societal healthcare needs. This proposed framework not only lays the foundation for further improvements in initial education but could also support pharmacists' development, assure practice consistency and contribute to excellence in pharmacists' performance in the Saudi context.

Phase 2b integrated the findings from phases 1 and 2a to inform the development of a country-specific national competency framework. The integration of these findings also helped to validate the participants' views of the required services within the local context from both the users and providers of services, as well as the required competencies from practitioners and pharmacy experts.

The public respondents in phase 1 expressed the desire to have point-of-care tests and therapeutic substitution services in community pharmacies (Chapter 4), which

were also recommended by the participating pharmacists in phase 2a in their responses to the open-ended questions about suggestions for additional behaviours (Chapter 5). Similarly, pharmacists suggested the provision of point-of-care testing in community pharmacies and the discussion of appropriate generic substitutions according to the patient's preferences and/or budget. Interestingly, there was unanimous agreement between the experts in phase 2b regarding the appropriateness of the inclusion of these competencies in the proposed national competency framework. Consequently, there was a significant amendment to the adapted framework to include these two new behaviours suggested by both the public and pharmacists.

The consultation with practising pharmacists (phase 2a) and pharmacy experts (phase 2b) also enabled the collection of more views about different areas of practice for a greater understanding and validation of the relevance and appropriateness of the FIP GbCF competencies to current Saudi pharmacy practice. For example, there was a consistency of opinions regarding the ten behavioural statements being less relevant to the current pharmacists' responsibilities and roles (Chapter 5). This consistency further informed the modifications in phase 2b to make the developed framework fit for purpose and relevant to all pharmacists in the Saudi pharmacy practice context.

The integration of the findings from each phase was an advantage of applying a mixed method design to identify the competencies required for effective pharmacy performance in Saudi Arabia. Consequently, this helped to develop a complementary picture, identify trends, and validate results about services and competencies required for effective professional performance thereby informing the development of a unique framework specific to the needs of pharmacy practice in the Saudi context.

7.2.3 The extent to which the current pharmacy education meets the identified competencies

Phase 3 (Chapter 6) addressed the third research question: "To what extent is Saudi pharmacy education is able to prepare qualified pharmacists equipped with the required competencies to address healthcare needs?"

The findings from the curriculum mapping showed that most competencies of the proposed national competency framework were present in the two sampled PharmD curricula. However, in terms of curricular weighting and competency emphasis, both programmes placed more emphasis on the technical aspects than professional practice, despite being clinically oriented programmes. Several gaps were also identified between current initial education programmes and competencies involved in the proposed national competency framework suggesting that the current initial pharmacy education might not prepare the students sufficiently to provide the full range of quality pharmaceutical services as per the country's pharmacy practice needs. Of note, the phase 1 and 2 findings validated the findings from phase 3, contributing to our understanding of pharmacists' current competencies and graduates' readiness to practise. An illustration of this is that health promotion, minor illnesses consultations, management and monitoring of NCDs services by pharmacists were identified as lacking in phase 1 to optimise health system capacity, and correspondingly the competencies required for the effective delivery of these services were identified in phases 2 and 3 as missing from both in-service and pre-service pharmacists.

In phase 2a, responding pharmacists rated "patient consultation and diagnosis" competency as not relevant to their practice. The curricular maps from phase 3 illustrated that there is little emphasis on this competency in the sampled PharmD programmes curricula, which may explain the non-relevance of this competency to the practice of pharmacists in the national survey. However, the recent legislation allowing pharmacists to provide minor illness consultations in community pharmacies stresses the need for local initial education to increase curricular emphasis on "patient consultation and diagnosis" competency to fulfil the new role

of pharmacists in community pharmacy and the consumers' desire of having such services in an accessible healthcare setting, as illustrated in phase 1 findings.

Phase 3 also revealed that "health promotion" was a missing competency from the sampled PharmD programmes despite being a common practice of pharmacists, as illustrated in phase 2. Similarly, "dispensing" of medications was reported in phases 1 and 2 as the current key role of pharmacists in Saudi Arabia but is less emphasised in the sampled programmes. This not only suggests that pharmacists acquire these skills on the job but also questions the quality of pharmacists' delivery of this service and consequently, the quality of its outcomes for the community. The low emphasis on "dispensing" in initial education could also support the explanation provided in section 7.2.1 to explain the contradiction between phase 1 and phase 2a in relation to the public dissatisfaction with the lack of detailed medication counselling during a medication dispensing. The lack of focus on such core competencies in initial education may contribute to the inadequate medication counselling and dispensing services provided by pharmacists, thereby the dissatisfaction expressed by the respondents with these services in phase 1.

Monitoring of NCDs in community pharmacies was also identified in phase 1 as a service that could extend the capacity of the health system. The phase 2a and phase 2b findings indicated that it is not only relevant and appropriate to the current practice but is also required to enable community pharmacists to extend their services and progress their profession. However, the phase 3 findings indicated that "monitor medicines therapy" is a competency with less curricular emphasis in both programmes (Chapter 6).

Phase 3 also illustrated an important finding related to the instructional content and clinical orientation of the sampled PharmD curricula that validates those from phase 1 about the concerns expressed by professionals on the quality of the transformation from BPharm to PharmD. Participants felt that the transformation to PharmD in most schools is not effective since students are not equipped with effective clinical-based skills and knowledge. The curricular weighting of the course

contact hours in phase 3 illustrated a variation in the proportion and the orientation of the total curricular time between the two curricula, with one tending to be more physical sciences oriented and the other more practice focused. Interestingly, both of the sampled curricula show a similar emphasis on competencies, with more emphasis on "medicines", "compounding of medicines", and "quality assurance and research in the workplace" and less emphasis on "health promotion", "dispensing "and "patient consultation and diagnosis". The low emphasis on "patient consultation and diagnosis", "health promotion", "medication counselling and advice", "dispensing", and "monitor medicines therapy" in phase 3 validate the phase 1 and phase 2 findings about the existence of competency gaps between current initial education and real practice needs. This gap also confirms that from a practice perspective, local pharmacy education has contributed to a large extent to the relative unpreparedness of graduates to deliver more than the 'traditional' service immediately after graduation in community pharmacies where opportunities for expanded roles of pharmacists to address societal healthcare needs exist.

Regarding the competencies within the OM cluster, findings showed that acquiring and/or developing competencies related to OM in foundation-level pharmacists receives less attention from practitioners and experts as well as from educators in initial education. In phase 2a, the level of relevance of OM competencies was the lowest in the national survey, with a large difference of opinions on its appropriateness for practice in phase 2b. In phase 3, both curricula were shown to lack almost all competencies within the OM cluster. Of note, the findings from the study phases are comparable to other similar studies conducted elsewhere (Mucalo et al., 2016; Al-Haqan et al., 2021; Udoh et al., 2018; Arakawa et al., 2020b). A possible explanation for this might be that the application and appropriateness of the OM behaviours for foundation level pharmacists are often dependent on the local and national circumstances as the type and level of organisation and management tasks for pharmacists can be country specific (Mucalo et al., 2016). In the Saudi context, this may be explained by the fact that a majority of management roles and tasks are a responsibility of senior pharmacists at the level of organisation

or sector rather than of foundation level pharmacists on a departmental level. However, the consistency of findings about OM competencies between the study phases raises the question of whether these competencies are perceived important or essential to be acquired or practised in initial education or early years of career by the practitioners, employers, policymakers and educators to enable pharmacists' transition to leadership roles and ensure a consistently high calibre of professional performance. As these competencies appear to be lacking in initial education, more studies are needed to explore how foundation-level pharmacists gain these skills, organise and manage their daily routine tasks and to what extent applying OM competencies could facilitate a timely, efficient and quality execution of their routine tasks.

Being an important competency for practice in community settings, the findings from the professionals in phase 1 showed that graduates lack effective and appropriate communication skills and that initial education does not teach or train graduates sufficiently to develop their verbal, non-verbal and listening communication skills for use immediately after graduation. Phase 3 reflected this finding illustrating "communication skills" as less emphasised in both sampled schools' curricula. These findings explain the views of public respondents in phase 1 that fresh graduates lack effective and appropriate communication skills and appear hesitant to deal with or interact with them, consequently, public hesitancy to trust fresh graduates about their medication-related inquiries.

In addition to "communication skills", "CPD", "interprofessional collaboration", and "leadership and self-regulation", were also highlighted in phase 1 as being required for community-centred pharmacy practice. Yet, these competencies appear to receive less emphasis in the sampled programmes, despite being perceived as highly relevant in phase 2a and required for current and future practice by the experts in phase 2b.

Regardless of the level of the responsibility and practice, the final result of pharmacy institutions in the provision of healthcare requires not only clinical and

technical competencies of PPH and PC but also a complementary mix of OM and PP competencies to manage and organise drug supplies, operations, procurement, communication, self-regulation and teamwork. The continuous development and expansion of pharmacy roles and services in the Saudi context require these competencies to be cultivated in pharmacists from the start of their training to assure timely and efficient quality service execution. Embedding these competencies into initial education will therefore facilitate a smooth transition from initial education to foundation level and eventually to an advanced and specialised practice. By that, not only will the quality and safety of patients' services be delivered to a minimum standards but also excellence in practice as well as impact and outcomes of the profession within the heath system will be attained and maintained.

7.3 Other key findings

While this study addressed the research questions developed in Chapter 2 to explore the extent to which pharmacy education in Saudi Arabia prepares competent pharmacists to address societal healthcare needs, it also provided a new understanding of several issues related to the current status of pharmacy education and pharmacists' roles in Saudi Arabia, as outlined below.

7.3.1 Pharmacy education

While phase 1 of this research aimed to assess local healthcare needs and the required roles of pharmacists in addressing them, it was striking to note the extent to which the professional participants described key issues they perceive to currently challenge initial education and graduates' readiness to practise in the Saudi pharmacy practice context. Despite no questions about pharmacy education in this phase of the study, the participants' responses confirmed the dynamic relationship between education, practice and policy. That is, in any specific context, the status of pharmacy education cannot be isolated from the realities of practice which, in turn, is influenced by the government system and policies. These findings provided a deeper insight into the status of pharmacy education, particularly the

PharmD programme, curriculum content, academic capacity, and quality assurance measures.

7.3.1.1 Degrees and educational programmes

It is argued that the reason for the existence of the two programmes, i.e., BPharm and PharmD, as an entry-degree to practice is the various pharmacy practice options available for PharmD or BPharm graduates (Aljadhey et al., 2017). However, from my study, this does not appear to be the case since phase 1 suggested that current educational programmes focus on preparing their students to practise in hospitals and neglect other areas of practice. The focus of the curriculum on hospital practice cultivated the "hospital mind set" in graduates, prompting them to believe that they must work in hospitals for a stable career path and that any other work opportunity is considered temporary to their preferred and permanent job in hospitals. Phase 1 shed light on the impact that pharmacy policymakers might have had on the scope of practice and education suggesting that their professional background, which is largely hospital and clinical-based, might have influenced the direction and scope of practice, consequently, the scope of undergraduate and postgraduate education, professional development programmes and CE activities to be mainly focused on hospital practice.

7.3.1.2 Curriculum

While the main reason for most pharmacy schools adopting the PharmD programme in Saudi Arabia is purported to be to prepare clinically oriented pharmacists, phase 1 suggests this may not reflect reality. The general content and clinical orientation of PharmD is, to a large extent, similar to the content and general orientation of a BPharm programme. The findings from phase 3 validated the findings from phase 1 and are contrary to that of Aljedei and Almeman (2016) and Asiri (2011) who claimed that the local PharmD curricula are heavily weighted with pharmacy practice and clinical pharmacy courses. The sampled programmes are product-oriented with most focus on the technical aspects rather than on the practice.

The findings from phase 1 further support the conclusions from other local research (Alaqeel and Abanmy, 2015; Balkhi et al., 2020) that most curricula lack dedicated courses and training in community pharmacy, highlighting that this has contributed to creating a competency gap, thus graduates' non-readiness to practise in this field. Phase 1 also highlighted that this contributed to the lack of awareness and understanding of future pharmacists about this area of practice as a possible career option.

7.3.1.3 Quality assurance measures

Pharmacy schools are slowly moving towards obtaining national or international accreditation. Phase 1 revealed that the slow movement is because of not imposing accreditation as a prerequisite for graduates' registration or obtaining government funding. Furthermore, obtaining national accreditation is more complicated than international accreditation because of certain quality management standards and procedures that must be achieved by schools to obtain national accreditation for their educational programmes.

The lack of a national competency framework as an overarching guide to standardise competencies required for graduates was highlighted by professionals in phase 1 has prompted educational institutions to develop their curricula based on what they perceive is needed in the labour market rather than on practice requirements and potential future roles. The phase 3 findings provided an example of this in the variation illustrated in competency emphasis among the sampled programmes where one placed more emphasis on "legal and regulatory practice", "monitor medicines therapy", "communication skills" and "medicines" competencies, whereas the other focussed more on "medicines information and advice", "compounding medicines", "medicines", "patient consultations and diagnosis" and "legal and regulatory practice" competencies.

7.3.1.4 Academic capacity

While the rapid growth of pharmacy schools over the last decades in Saudi Arabia was required to produce native pharmacists, the phase 1 findings highlighted how

this dramatic increase might have affected the quality of graduates as many new schools faced, and continue to face, challenges to recruit adequate quantity and quality of academic faculty and teaching practitioners. The continuous nationwide shortage of qualified teaching faculty and teaching practitioners to teach pharmacy practice and clinical pharmacy courses in a clinical oriented programme, such as PharmD, has been reported as a critical challenge for local education affecting not only the quality of graduates but also their practice. The scarcity of faculty with a clinical background was reported by professionals to create a gap between education and practice as non-clinical faculty were used by many schools to teach clinical pharmacy-related courses. Consequently, the education is more theoretically based not linking the dynamic changes of practice, changing guidelines, real-life scenarios and patient expectations into the curriculum.

Consistent with other studies (Almeman and Al-jedai, 2016; Al-jedai et al., 2016; Badreldin et al., 2020), my phase 1 findings also illustrated the limited capacity of training sites, including hospitals and community pharmacies to be another critical challenge to local education, especially for schools located in rural areas and those in major cities where there is competition for the available training sites. This contributes to the gap in some skills, such as communication skills and interprofessional collaboration in graduates, due to the limited opportunities to strengthen several domains of skills and knowledge of implementing pharmaceutical care processes to provide quality and effective care services during experiential training.

7.3.2 Pharmacists' roles for addressing healthcare needs

The findings indicated that preparing local pharmacists to provide pharmaceutical care roles in community pharmacies not only addresses the existing societal needs of accessible and appropriate primary healthcare services and medicines information and advice services but also fulfils the MOH strategy for transforming the pharmacy sector by 2030.

For many years, the focus of the pharmacy profession in Saudi Arabia was on the practice of hospital pharmacy even though hospitals represent a small part of the pharmaceutical sector in the country and the provision of any services or initiatives, regardless of the size or impact, will be still limited to the population of that hospital.

The pharmacy profession is continuously evolving in Saudi Arabia. As part of the Saudi Vision 2030 strategy to transform the health sector, the MOH is currently undertaking major steps to transform pharmacy practice from the traditional inpatient model of pharmaceutical care services to ambulatory pharmaceutical care services provided in community pharmacies (Alomi, 2017). Under the new model of practice, the legislation has recently permitted the provision of some clinical services, such as vaccination, patient education and counselling, vital signs assessment, medication therapy management and chronic diseases management, pharmaceutical consultations, and set several regulations, initiatives and programmes to enable the implementation and execution of these new services in community pharmacies (Ministry of Health, 2019). However, the required skills for providing such roles in community settings are still lacking. Community pharmacists in Saudi Arabia lack adequate training and skills to educate, diagnose and/or prescribe medicines. Initial education also seems to be lagging behind and not coping with the current major health system transformation, as well as the new realities of the profession and its practices. The findings from phases 1, 2a and 3 highlighted gaps in competencies of high relevance to the new roles in community pharmacy, in both in-service and pre-service pharmacists, namely, "medicines information and advice", "patient consultation and diagnosis", "health promotion", "dispensing", "monitor medicines therapy" and "communication skills". The mismatch between initial education and other professional development activities with real practice needs and expectations may have limited graduates' preparedness and pharmacists' non-fulfilment of the new expected roles. The current transformation of the country's health system as well as societal needs and expectations of pharmacists must serve as stimuli for innovation, rethinking and revaluation of how current pharmacy education and professional development

programmes in Saudi Arabia could educate and prepare students for a growing era of practice.

The provision of the expanded pharmaceutical services as per the 2030 Vision requires the parallel change of competency standards for graduates in initial education and other professional development activities towards knowing and applying the principles surrounding the activities to promote health, manage drug therapy and optimise patients' quality of life (Wiedenmayer et al., 2006; Van Mil et al., 2004). This dictates pharmacy curricula to incorporate not only foundation scientific knowledge of medicinal products, as shown from phase 3 findings, but also to strengthen several domains of skills and knowledge of implementing pharmaceutical care processes to provide quality and effective care services (Awaisu and Mottram, 2018). This means incorporating a balanced and wide mix of core competencies, including knowledge base and skills, to optimise patients' drugrelated needs such as patient assessment, laboratory data interpretation, diagnosis, patient consultation, drug monitoring as well as interviewing skills, communication skills and documentation skills (Awaisu and Mottram, 2018). In this way, the enacted competencies of pharmacy education will match the functions and responsibilities of a pharmacist as appropriate to the healthcare needs for effective pharmaceutical services in community settings.

It is important to mention here that the high need and opportunities for pharmacists in Saudi Arabia are not inclusive to community pharmacy practice only. The assessment of local healthcare needs in phase 1 identified the need for diversification of pharmacists' roles in both direct and non-direct care to address the country's needs from pharmacists. While the supply of traditional pharmacists is required currently to transform the practice and fulfil patient-oriented services needed in community pharmacies, phase 1 highlighted a future need for pharmacists in non-patient-facing roles, namely, the pharmaceutical industry. As the government establishes strategic plans to localise this industry and secure a sustainable source of medications, the pharmaceutical industry is currently an

emerging practice area with a high need for local pharmacists and offering a plethora of jobs and opportunities for innovation, advocacy and development.

To guarantee practice readiness, pharmacy education should feature emerging practice areas, highlight developed pharmacy practice models and promote practice transformation to the increased demands and opportunities for pharmacists (Kanmaz et al., 2022). The breadth of career opportunities available to pharmacists requires pharmacy schools to prepare students to use competencies earned from their education in many different roles (Lebovitz and Rudolph, 2020). Therefore, the transformation of the current educational model and educational curricula in Saudi pharmacy education is required to reflect the current changes in practice and drive the transformation to wide-ranging fields of highly qualified pharmacists in both direct and non-direct care roles to meet the country's needs. This will support non-traditional career interests, and enhance graduate opportunities for innovation, advocacy and development without sacrificing developing professional fundamental patient care skills for all future pharmacy professionals (Kanmaz et al., 2022).

7.4 Implications and recommendations

A competent pharmacy workforce is fundamental for ensuring the high-quality delivery of pharmaceutical services. An adequate number of appropriately educated and trained competent pharmacists will not only positively affect health outcomes but also promote sustainable access to essential medicines and primary healthcare services, thereby strengthening the health system's performance. Therefore, this research urges pharmacy stakeholders to prioritise health system strengthening including a fit-for-purpose and competent pharmacy workforce. The following sections provide recommendations to achieve this.

7.4.1 Implications for education

The present study findings have implications for education at both undergraduate and postgraduate levels, leading to the education-related recommendations outlined below:

7.4.1.1 Initial education

This study provided insights into the status of local pharmacy education and the readiness of the graduates to join the labour market. It highlighted a mismatch between initial education and real practice expectations and the focus of local curricula and experiential training mainly on hospital pharmacy practice. This has hindered the students' abilities to explore other career paths where there is an increased demand and opportunities for pharmacists, such as community pharmacy and the pharmaceutical industry. The lack of sufficient quality assurance measures, i.e., mandatory accreditation and a national competency framework, to guide education provision and outcomes assessment might have limited the graduates' capacity to the desired level of competence to meet the country's healthcare needs. The limited number of teaching practitioners and training sites has also created a gap between education and practice. Therefore, the main recommendations for initial education to qualify the graduates with needs-based competencies and make them practice ready to perform effectively and fulfil their expectations in the actual practice are summarised as follows:

7.4.1.1.1 Curriculum

- Reconsider the current hospital-focused curriculum for its inappropriateness to the needs of the actual practice environment.
- Review and structure the current curricula to align its outcomes with a national competency framework (e.g., the proposed national competency framework). This study does not advocate for developing a "one size fits all" curriculum as a means to enhance the quality of pharmacy education outcomes in Saudi Arabia but rather it calls for the adoption of a national competency framework by schools as an overarching guide to standardise competencies required for graduates to achieve from initial education.
- Review the curricula periodically to ensure appropriateness and relevance to practice.
- Consider competency-based learning and teaching approaches and tools.

- Consider Integration of science and practice elements in the delivery of the new curriculum.
- Promote community pharmacy roles for students within the dedicated curricula and experiential training.
- Offer more, various and new elective experiential training rotations for the students to further explore areas of practice where job opportunities for pharmacists are available, both in direct and non-direct care roles.

7.4.1.1.2 Academic capacity

Consider innovative expansion of teaching practitioners; expert pharmacists
or clinicians, for example, could be employed as teaching practitioners.
 Moving full-time academics, especially those from a clinical background, to
part-time could be another way to increase the number of teaching
practitioners.

7.4.1.1.3 Quality assurance measures

- Adopt appropriate mechanisms to assure the minimum acceptable level of quality educational outcomes to advance pharmacy education. This includes mandating national accreditation and adopting the proposed national competency framework to inform the development of quality and competency-based education.
- Ensure that national accreditation can be obtained and maintained throughout the pharmacy programmes in all schools.

7.4.1.2 Post graduate education

 Consider using the proposed national competency framework to support pharmacy workforce seamless transition and development within their scope of practice across all practice settings in accordance with the MOH transformation strategy for the pharmacy sector.

- Establish certified training programmes for in-service community
 pharmacists to enable them develop their competencies in accordance with
 the new roles.
- Develop CPD programmes and CE activities based on the MOH transformation strategy for developing the pharmacy sector.
- Consider using the proposed competency framework to structure CPD
 programmes and CE activities. This will assist pharmacists in targeting their
 individual educational and professional developmental needs to fulfil the
 new roles.

7.4.2 Implications for practice and policy

The present study findings have implications for practice and policy, leading to the practice and policy-related recommendations outlined below.

The current hospital-focused practice was identified in this study as not responding to the current challenges and needs of the health system and population. This study provided insights into how pharmacy services and pharmacists' roles in community pharmacy could extend the capacity and responsiveness of the health system to the growing and ageing population, as well as the changing diseases pattern and transforming health system. The position of community pharmacies as the most accessible healthcare setting qualifies community pharmacists to be the main access point of patients to primary healthcare and provide several preventive and public health services. The current transformation of the health system suggests the need for highly qualified pharmacists, not only in direct care roles (e.g., hospitals, PHCCs, community pharmacies) to meet the country's needs but also in non-direct care roles (e.g., pharmaceutical industry, health technology, health economics, health insurance, health service research, procurement and supply chains) where there is an increased need and job opportunities for pharmacists. Nevertheless, the expansion of the roles requires collaborative efforts from all relevant stakeholders to enable effective and wide implementation of such roles, thereby maximising the benefits and future sustainability. Therefore, the main recommendations for practice and policy are summarised as follows:

7.4.2.1 Stakeholders' collaboration

- Develop a profession-wide competency framework that applies to all
 pharmacists across all levels and settings of practice in Saudi Arabia. This will
 harmonise pharmacy education outcomes and bring the required change in
 pharmacy education to address the required needs of the population and
 the health system.
- Analyse the current labour market demands of every pharmacy sector and plan the required supply from initial education.

7.4.2.2 Professional identity

- Acknowledge pharmacists as primary healthcare providers in national health policies. This should be considered at the external level by governmental agencies and professional bodies to promote the role of pharmacists as care providers with other healthcare professionals, regulators and the public; and at the internal level by educational institutions, professional bodies and continuing education providers with the pharmacists (both pre-service and in-service pharmacists).
- Establish leadership development programmes for pharmacy students and foundation level pharmacists to enable their transition to leadership roles in the future.

7.4.2.3 Governmental policies

- SCFHS should consider using the proposed competency framework to inform
 the development of the licensure exam (SPLE) not only to measure
 pharmacists' minimum knowledge for registration but also to design
 appropriate activities to assess pharmacists' fitness to practise upon
 registration.
- SCFHS should consider developing national assessment and training programmes for overseas pharmacists to establish and ensure consistent performance before undertaking the licensure exam (SPLE).

SCFHS should consider using the proposed competency framework to design
national assessment, CE and CPD training programmes at a national level to
reduce the variation in competencies and of professional performance
reported in this study between local and overseas pharmacists; and between
male and female pharmacists.

7.4.2.4 Workforce planning

Align pharmacy workforce development plans and strategies with healthcare
and pharmaceutical needs. Policies and strategies should be mobilised to
prioritise education capacity development for and quality of pharmacists.
 Such strategies should not be directed to increasing the number of
pharmacy graduates only, but also improving the quality and competencies
of graduates to perform effectively based on labour market needs.

7.5 Strengths and limitations of the thesis

This study employed an innovative and inclusive approach to assessing the status of Saudi pharmacy education and the extent to which it prepares graduated qualified with needs-based competencies. No study of the same scale and scope has been conducted in the Saudi pharmacy context. While other studies provided narratives about the status and challenges of Saudi pharmacy education, this study produced empirical evidence that can be used as a foundation to inform evidence-based policymaking and future planning.

This study has the following major strengths:

 It employed a well-structured sequential mixed methods research design to apply a needs-based educational model in the Saudi pharmacy context.
 Employing this design helped to develop a complementary picture of the required competencies to address societal needs from pharmaceutical services from different perspectives (policymakers, pharmacists, public) and different data sources (surveys, interviews, focus groups, NGTs, documented curricula) to enhance the validity and credibility of the findings.

- This is the first study to explore the societal healthcare needs and roles
 required of pharmacists to meet those needs from the perspectives of
 policymakers, pharmacists and the general public in the Saudi context.
- It is the first to assess the country's needs of pharmacists and pharmaceutical services.
- It developed the first profession-wide competency framework for foundation-level pharmacists in Saudi Arabia.
- This is the first study to assess and analyse the curricular content of local PharmD programmes using a global reference that has been modified to fit the requirements of the local pharmacy practice in Saudi Arabia.

While mixed methods research has several strengths, this approach may also bring some weaknesses that are inherent to the specific methods used in each study phase. Acknowledging this is also part of the reflexivity process that I maintained throughout this research, described in detail in Chapter 3, as well as the ways that I used to maintain the rigour, trustworthiness and quality of the research findings.

As in most research, this study has some limitations. The sample of participants in phase 1 (Chapter 4) does not represent the total pharmacy population or the general population. The findings, therefore, are not inclusive or generalisable but provide useful data and insights, which might be transferable to improve pharmacy education and practice in Saudi Arabia. Similarly, the purposive and convenient sampling approaches used with the professional and public respondents might not have captured the full spectrum of views of policymakers, pharmacists and the public.

While there was a high proportion of male to female participants in phase 1, phase 2a and 2b, this, however, reflects the gender distribution of pharmacists in Saudi Arabia, which is predominantly male (81%). Despite that, gender imbalance was not believed to skew the study findings as the research is related to needs-based workforce development.

The sample of two PharmD curricula in phase 3 (Chapter 6) does not represent the overall pharmacy education curricula in Saudi Arabia. The findings, therefore, are not inclusive or generalisable but insights might be transferable to improve pharmacy education in Saudi Arabia. To ensure the consistency of the mapping process, I conducted the mapping process initially and then reviewed the mapping findings with my research supervisors at multiple points to ensure the reliability of the findings. A second mapper would have increased the confidence in the mapping process and thus the findings of this phase. However, the limited time and resources could not made this achievable. Future work can include revalidation of the findings by including an independent mapper.

Other limitations included the contradictory findings of the qualitative and quantitative data in section 7.2.1, in which I went back to the qualitative data to reread it in its context, and reviewed relevant literature to come up with a possible explanation for this contradiction. While this revealed different perspectives and understandings about medication counselling and medication dispensing services, it also revealed that there is greater complexity in this aspect of pharmacy services and their related competencies than can be captured in any single perspective. Thus, the survey questions reflect how pharmacists perceive the meanings of these competencies and their understanding of fulfilling these competencies effectively. Therefore, interviewing more pharmacists may provide more insights and different perspectives about their understanding of fulfilling these competencies.

Finally, I solely collected, analysed and interpreted the data and since each researcher brings a preconceived set of ideas and views to the research, I am aware that I might unintentionally have swayed the findings. This was minimised by different measures in this study. I used a reflective journal to note my thoughts and assumptions throughout the research process. Research supervisors were involved in every step of the research process to provide feedback, enhance trustworthiness and reduce bias in the interpretation of the findings.

7.6 Benefits of this research

This research has:

- Identified the required roles and services of pharmacists to increase healthcare system capacity and responsiveness towards the current pattern of diseases within the Saudi context.
- Developed the first profession-wide national competency framework for foundation-level pharmacists in Saudi Arabia.
- Determined the status of pharmacy education and highlighted key determinants for education development.
- Identified competency gaps that need to be addressed to prepare practise ready competent pharmacists
- Analysed a sample of local PharmD programmes to determine the relevance of the local curricular content to the needs of the contemporary practice environment in Saudi Arabia.
- Highlighted major areas of focus for pharmacy education policymakers to aid
 in planning and implementation of competency-based pharmacy education.
- Involved major stakeholders in all research processes to ensure ownership
 of the decisions made to facilitate the implementation of the study
 recommendations.

7.7 Future research

This research developed an evidence-based tool that can guide initial education development and support professional development in performing their current and developing new roles to best meet the country's pharmaceutical needs. Further work is necessary to qualitatively explore the opinions of other stakeholders, including policymakers and practising pharmacists, about the validity and acceptability of this framework as a road map for pharmacists' career development. Furthermore, a validation study is required to obtain feedback from practitioners in non-direct patient care roles, such as industry, regulatory, and academia, on the suitability of this framework as a developmental tool in those areas of practise. Future research is needed to assess the impact of the implementation of this

framework on the quality of pharmacy education and pharmaceutical services. Finally, to ensure pharmacists' evolvement and role expansion, future research is suggested to develop an advanced level competency work for the inclusion of speciality services.

7.8 Conclusion

This study aimed to explore the extent to which pharmacy education can prepare competent pharmacists to address the healthcare needs for pharmacy practice in Saudi Arabia. Based on qualitative and quantitative analyses of societal healthcare needs, pharmacists' roles, core competencies and curricular core quality elements within the local context of Saudi Arabia, it can be concluded that there is a mismatch between initial education and real practice needs and expectations. While the country's current needs of pharmacists are to optimise health system capacity and increase access to primary care services and medicines expertise in community pharmacies, the study indicated local education is product-oriented with a focus of curricular content and experiential training opportunities in most schools on preparing future pharmacists for hospital pharmacy practice. The study also identified several gaps between current initial education programmes and the competencies required to practise the expected roles suggesting that current initial education might not prepare the students sufficiently to provide the full range of quality pharmaceutical services as per the country's pharmacy practice needs.

The empirical findings provide a new understanding of graduates' readiness to practise as per the country's pharmacy practice needs, the quality of educational programmes and pharmacists' professional development opportunities in Saudi Arabia. Core quality elements were identified to inform the development of competency-based education and recommendations were offered to maximise the graduates' capacity to the desired level of competence.

To address the country's need for qualified and competent pharmacists, pharmacy education policymakers are urged to develop local curricula with respect to needsbased competencies to reflect the current changes in practice. By doing so, future

pharmacists will not only be qualified with the required competencies to transform practice and fulfil patient-oriented services in community pharmacies but also will be qualified to use the competencies earned from their education in other growing roles in non-direct care pharmacy institutions where there is an increased need and job opportunities for pharmacists. This will ensure graduates' readiness to provide the full range of quality pharmaceutical services, drive the diversification of pharmacists' roles in both direct and non-direct care and stimulate the growth of the profession beyond hospital-centred pharmacy practice. By that, not only the required pharmaceutical services to best meet societal healthcare needs will be effectively delivered but also the impact and outcomes of the pharmacy profession in Saudi Arabia will be achieved.

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Appendices

Appendix 1: Research ethics form (011-19)



V1.0 Updated 18/07/18

SCHOOL OF PHARMACY APPLICATION FOR RESEARCH ETHICS REVIEW

Who should use this form:

This form is to be completed by PIs or supervisors (for UGR or PGR student research) who have completed the 'UG project ethics 2017 v1.doc' or 'PG project ethics 2017 v1.doc' forms and have been informed that further ethical review and approval is required before the commencement of a given Research Project.

Researchers in the following categories are to use this form:

- 1. The project is to be conducted by:
 - o staff of the University of Nottingham; or
 - postgraduate research (PGR) students enrolled at the University of Nottingham; or
 - undergraduate research (UGR) (to be completed by the student's supervisor);
- 2. The project is to be conducted at the University of Nottingham by visiting researchers.

NOTES:

- An electronic version of the completed form should be submitted to the Research Ethics Officer, at the following email address: <u>PA-PHARM-ETHICS@exmail.nottingham.ac.uk</u>. Please do not submit paper copies.
- If, in any section, you find that you have insufficient space, or you wish to supply additional material not specifically requested by the form, please it in a separate file, clearly marked and attached to the submission email.
- If you have any queries about the form, please address them to the Research Ethics Team.
 - Before submitting, please tick this box to confirm that you have consulted and understood the following information and guidance and that you have taken it into account when completing your application:
 - The information and guidance provided on the School of Pharmacy's Research Ethics webpages on workspace (https://workspace.nottingham.ac.uk/display/Pharm/Ethical+Review+Processes)
 - The University's Code of Practice for Research (https://workspace.nottingham.ac.uk/display/ResEth/Code+of+Research+Conduct+and+Research+Ethics)



UK CHINA MALAYSIA			V1.0 Updated 18/07/1		
SCHOOL APPLICATION	OF PHARM		OFFICE USE ONLY; Application No: Date Received:		
4 7171 5 05 050 1507			•		
An exploration of the sui healthcare needs	tability of pharma	cy education in Saud	li Arabia to prepare graduates to med		
2. SHORT TITLE					
-					
3. THIS PROJECT IS: University of Nottingham S University of Nottingham P University of Nottingham U Other (Please specify):	ostgraduate Rese	arch (PGR) Student	<u> </u>		
4. INVESTIGATORS a) PLEASE GIVE DETA PGR STUDENT PRO		NCIPAL INVESTIG	ATORS OR SUPERVISORS (FOR		
	ne / family name	Dr Stephanie Bridg			
Highest qualification & p	osition held:	Associate Professor, Clinical Pharmacy Practice			
School/Department Telephone:		01159515064	y/Pharmacy Practice & Policy		
Email address:			@nottingham.ac.uk		
Email address.		Otephanic.Bridges	ghottingham.ao.ak		
Name: Title / first nar	ne / family name	Dr Naoko Arakawa			
Highest qualification & p		Assistant Professo	r in International Pharmacy		
School/Department		School of Pharmacy/Pharmacy Practice & Policy 01157484559			
Telephone:					
Email address:		Naoko.Arakawa@i	nottingham.ac.uk		
b) PLEASE GIVE DET/ STUDENT PROJEC		-INVESTIGATORS	OR CO-SUPERVISORS (FOR PGR		
Name: Title / first name /					
Highest qualification & p	osition held:				
School/Department					
Telephone: Email address:					
			- 7.0 1 - 1 - 1		
c) In the case of PGR	student projects,	, please give detail:	s of the student		
Name of	Salihah Alfaifi	Student No:			
Course of study: Principal supervisor:	PhD in pharmac Dr. Stephanie Bridges & Dr. Na Arakawa		salihah.alfaifi@nottingham.ac.uk		
5. ESTIMATED START OF I	PROJECT D	ate: 01/09/2	2019		
ESTIMATED END OF PR		ate: 30/06/2			



6. FUNDING

Funding Body	Approved/Pending /To be submitted
Ministry of Education, Saudi Arabia	Approved
including funding-related deadlines). You sh	ır application, please explain the reasons below ould be aware that whilst effort will be made in
meet such requests. The average turnarou	e possible for the Research Ethics Committees nd time is 6 weeks but can take longer for more
meet such requests. The average turnarou	



7. SUMMARY OF PROJECT

Describe the purpose, background rationale for the proposed project, as well as the hypotheses/research questions to be examined and expected outcomes. This description should be in everyday language that is free from jargon. Please explain any technical terms or discipline-specific phrases.

Background:

Despite the recent expansion of the number of pharmacy colleges in Saudi Arabia over recent decades, it has been suggested that there is inconsistency of pharmacy education. Pharmacy education delivered. Pharmacy education standards and outcomes must be tailored to meet the rapid development of healthcare system requirements as well as the needs of society. Therefore, evaluation of pharmacy education curricula and outcomes is crucial to ensure the quality of educational curricula, in order to produce graduates equipped with need-based competencies. The identification of core competencies is essential to the establishment of a national competency framework, to inform the pharmacy education process, curriculum development, and the learning outcomes of undergraduate students. The framework will also assist current practice pharmacists in assessing their capabilities and learning needs, in order to enhance the quality of practice and patient outcomes through continuing professional development.

The PhD project will focus to answer the following research questions:

- 1. What are the core competencies essential for registered pharmacists to fit healthcare needs and services in the country?
- 2. To what extent is Saudi pharmacy education able to prepare competent pharmacists equipped with the required competencies that address the local healthcare needs?
- 3. How can the identified competencies be utilized to improve pharmacy education in the country?

Objectives:

- To explore healthcare needs and pharmacists' roles in various pharmacy practice settings in Saudi Arabia
- To identify and describe core competencies considered essential for registered pharmacists in Saudi Arabia; and for the development of a national competency framework
- To assess to what extent the current pharmacy programme in Saudi Arabia meets the national competency framework through curriculum mapping
- To develop metrics for the establishment of core competencies and assessment in the curriculum

Expected results

The result from this study will be used to understand:

- The current status of Saudi pharmacy education, stakeholders' and practice pharmacists' perspectives on healthcare needs and pharmacists roles, competencies required to meet these needs, impact of competencies implementation in the curriculum
- This knowledge will be used in order to improve pharmacy education using evidence-based approach.
- Defining the core competencies for practicing pharmacy in the country will inform the
 establishment of a national competency framework. This will help determine whether the
 required educational core quality elements and outcomes for the impact on the profession of
 pharmacy are established and maintained in Saudi Arabia.



8. CONDUCT OF PROJECT

Please give a description of the research methodology that will be used

THE CURRENT ETHICS APPLICATION IS FOR PHASE I

Mixed methods will be used to conduct the research which is an approach used for data collection and analysis through integration of both qualitative and quantitative data. An exploratory, sequential, mixed methods design will be used to conduct three phases.

Phase I: Phase I will include two steps

The perceptions of pharmacy professionals and public about healthcare needs and pharmacists roles will be explored using qualitative approach. Semi structured interviews will be used as data collection method for pharmacy professionals group (Phase Ia) while focus groups will be used with the public group (Phase Ib)

Phase II: Phase II will include two steps.

Ila: A nationwide survey to Saudi pharmacists in various fields of pharmacy practice will be used to identify the degree of the relevance of the International Pharmaceutical Federation-Global Competency Framework (GbCF) in Saudi pharmacy practice.

Ilb: the findings from this survey in addition to the findings of Phase I will be presented to a panel of experts, using consensus methods to identify and describe core competencies. This will allow establishment of a national competency framework.

Phase III:

The syllabus of PharmD programme of King Saud University College of Pharmacy will be used as a national standard for mapping and analysis against the identified competencies. This will help to assess if the current pharmacy programme meets the national competency framework and to develop metrics to establish and assess core competencies in the educational curriculum.

9. DOES THE PROJECT INVOLVE PARTICIPATION OF PEOPLE OTHER THAN THE RESEARCHERS AND SUPERVISORS?

Yes 🛚	No 🔲
-------	------

Note: 'Participation' includes both active participation (such as when participants take part in an interview) and cases where participants take part in the study without their knowledge and consent at the time (for example, in crowd behaviour research).

If you have answered NO please go to Section 18. If you have answered YES to this question please complete all the following sections.

10. PARTICIPANTS AS THE SUBJECTS OF THE RESEARCH

Describe the number of participants and important characteristics (such as age, gender, location, affiliation, level of fitness, intellectual ability etc.). Specify any inclusion/exclusion criteria to be used.



THE CURRENT ETHICS APPLICATION IS FOR PHASE I

Phase I study:

la: in this phase we are interested to interview policy makers and practice pharmacists. Inclusion criteria for policy makers participants:

- Policy makers, educators, and national pharmacy organization representatives who currently
 have or had some role in pharmacy practice and/or education policy making
- Current or retired well known or experienced person in pharmacy practice and/or education
- Have healthcare background

Inclusion criteria for practice pharmacists participants:

- · Practice pharmacists with middle or senior management position
- · Any gender

lb: in this phase we are interested to interview members of the public. Inclusion criteria:

Inclusion criteria for public participants:

- Over 18 years old
- Saudi citizens
- Any gender
- Beneficiary of healthcare services in Saudi Arabia (either governmental or private)
- · Capable to consent themselves

Phase II study:

IIa: we are interested to survey practice pharmacists in Saudi Arabia

Inclusion criteria for practice pharmacists:

- · Any registered pharmacists
- Any gender

IIb: we are interested to recruit pharmacy experts.

Inclusion criteria for experts:

- Expert policy makers, educators, practice pharmacists and national pharmacy organization representatives who currently have or had some role in pharmacy practice and/or education policy making and pharmacy practice
- Saudi citizen
- Any gender

11. RECRUITMENT

Please state clearly how the participants will be identified, approached and recruited. Include any relationship between the investigator(s) and participant(s) (e.g. instructor-student).

Note: Attach a copy of any poster(s), advertisement(s) or letter(s) to be used for recruitment.

The Saudi Council of Pharmacy Profession will act as gatekeeper for the recruitment of pharmacists and experts for all health organizations. For recruitment of members of the public, flyers will be used in community centres, shopping malls, community pharmacies, healthcare settings. Any interested participant can contact the researcher through telephone/email and will then be provided with the information sheet and consent forms.



12. CONSENT

a) Describe the process that the investigator(s) will be using to obtain valid consent. If consent is not to be obtained explain why. If the participants are minors or for other reasons are not competent to consent, describe the proposed alternate source of consent, including any permission / information letter to be provided to the person(s) providing the consent.

The researcher will provide the participants with the information sheet and will explain the study details to ensure that the participant has sufficient time to consider participation or not. Also, the researcher will answer participants' questions concerning study participation. Then, a written informed consent will be obtained from the participants before they attend the interviews or fill the surveys to confirm their participation approval and to request their permission to audio record interviews. One copy of the consent form will be kept by the participant and one will be kept by the researcher.

The attached information sheet and the consent forms will be translated to Arabic for the public phase (lb).

Please find attached the information sheet and consent forms.	
Note: Attach a copy of the Participant Information Sheet (if applicable), the Consent Form (if applicable), the content of any telephone script (if applicable) and any other material that will be used in the consent process. b) Will the participants be deceived in any way about the purpose of the study? Yes \(\simega\) No \(\simega\)	
If yes, please describe the nature and extent of the deception involved. Include how and when the deception will be revealed, and who will administer this feedback.	
3. PARTICIPANT FEEDBACK Explain what feedback/ information will be provided to the participants after participation in the research. (For example, a more complete description of the purpose of the research, or access to the results of the research).	
The findings of the research will be shared with the participants if they wish. A summary of the result will be sent to them through email at the end of the study.	:s

14. PARTICIPANT WITHDRAWAL

a) Describe how the participants will be informed of their right to withdraw from the project.



		*
to	Each participant will be asked to sign an informed consent. The form clearly state withdraw from the research at any time, without prejudice or negative consect of required to provide any reason for that. Also, the researcher will remind the purple ghts before conducting the interviews.	quences, and they are
b) E	Explain any consequences for the participant of withdrawing from the study and be done with the participant's data if they withdraw.	l indicate what will
	as stated in the information sheet: If the participant decided to withdraw from th lata will be kept for analysis and will not be erased, either form the interviews o	
Will pa	OMPENSATION articipants receive any compensation for participation? i) Financial ii) Non-financial es to either i) or ii) above, please provide details.	Yes ☐ No ⊠ Yes ☑ No ☐
	Refreshments and snacks will be provided to the members of the focus groups. vill be reimbursed.	Also, travel expenses
 If	participants choose to withdraw, how will you deal with compensation?	
-		
CONF	FIDENTIALITY	
a)	Will all participants be anonymous?	Yes ⊠ No 🗌
b)	Will all data be treated as confidential?	Yes ⊠ No 🗌
Note:	Participants' identity/data will be confidential if an assigned ID code or number not be anonymous. Anonymous data cannot be traced back to an individual pa	
	Describe the procedures to be used to ensure anonymity of participants and/o	

8



email, phone number primary investigator a	er, are considered conf	ich could be linked back to the results, such as: name, idential and will not be disclosed to third parties. Only ave access to these data. Participants will be anonymised the interviews.			
	If participant anonymity or confidentiality is not appropriate to this research project, explain, providing details of how all participants will be advised of the fact that data will not be anonymous or confidential.				
	n data will be stored, who security of the data, who	PATA ere, for what period of time, the measures that will be will have access to the data, and the method and			
online data manager		cord and personal identifiers will be stored in university 365 (OneDrive), where it will be encrypted and password- ss to the data.			
	ies at the university of N	ds and documents related to the study will be retained at Nottingham for at least 7 years or for longer as required.			
17. OTHER APPROVAL approvals.	S REQUIRED? e.g. Disc	closure and Barring Service (DBS) checks or NHS R&D			
☑ YES	□ NO	☐ NOT APPLICABLE			
If yes, please specify.					
The researcher will approval in Saudi Ar		versity School of Medicine Research Ethics Committee			

18. SIGNIFICANCE/BENEFITS

Outline the potential significance and/or benefits of the research

The study will help to reflect the current status of Saudi pharmacy practice and education. This will help to determine whether the required educational core quality elements and outcomes for the impact on the profession of pharmacy are established and maintained. Ensuring high quality education of pharmacists will assist to improve the ultimate benefits of patients and civil society as well as the overall national health.



19. RISKS

a) Outline any potential risks to **INDIVIDUALS**, including research staff, research participants, other individuals not involved in the research and the measures that will be taken to minimise any risks and

the procedures to be adopted in the event of mishap The researcher will set up "Lone Working Policy" with the School of Pharmacy's Health and Safety Office, as the study will be conducted overseas and without direct supervision. b) Outline any potential risks to THE ENVIRONMENT and/or SOCIETY and the measures that will be taken to minimise any risks and the procedures to be adopted in the event of mishap. 20. ARE THERE ANY OTHER ETHICAL ISSUES RAISED BY THE RESEARCH? Yes ☐ No 🛛 If yes, please specify



21. EXPERT REVIEWER/OPINION

You may be asked to nominate an expert reviewer for certain types of project, including those of an interventional nature or those involving significant risks. If you anticipate that this may apply to your work and you would like to nominate an expert reviewer at this stage, please provide details below.

	Two			1
	Name			
	Contact details (including email address)			
	Brief explanation of reasons for nominating and/or nominee	's suitability		
22				
22	. CHECKLIST			
PΙε	ease mark if the study involves any of the following:			
•	Vulnerable groups, such as children and young people aged under	er 18 years, t	those with	learning disability, or
	cognitive impairments		Ц	
•	Research that induces or results in or causes anxiety, stress, pain of to participants (which is more than is expected from everyday life)	or physical dis	scomfort, c	or poses a risk of harm
•	Risk to the personal safety of the researcher			
Deception or research that is conducted without full and informed consent of the participants at time study is carried out				
	Administration of a chemical agent or vaccines or other substance human participants.	es (including	vitamins c	or food substances) to
	Production and/or use of genetically modified plants or microbes			
•	Results that may have an adverse impact on the environment or fo	od safety		
	Results that may be used to develop chemical or biological weapon	ns		
Ple	ease check that the following documents are attached to your applica	fion		
18.00	эт э		-	NOT
		ATTACHE	,	NOT APPLICABLE
	Recruitment advertisement Participant information sheet			H
	Consent form	ă		Ħ
	Questionnaire Interview Schedule			
		444		_



23. DECLARATION BY APPLICANTS

I submit this application on the basis that the information it contains is confidential and will be used by the University of Nottingham (School of Pharmacy) solely for the purposes of ethical review and monitoring of the research project described herein, and to satisfy reporting requirements to regulatory bodies. The information will not be used for any other purpose without my prior consent.

I declare that:

- The information in this form together with any accompanying information is complete and correct to the best of my knowledge and belief and I take full responsibility for it.
- I undertake to abide by University Code of Practice for Research
 (https://workspace.nottingham.ac.uk/display/ResEth/Code+of+Research+Conduct+and+Research+
 Ethics) alongside any other relevant professional bodies' codes of conduct and/or ethical guidelines.
- I will report any changes affecting the ethical aspects of the project to the School of Pharmacy's Research Ethics Officer.
- I will report any adverse or unforeseen events which occur to the relevant Ethics Committee via the University of Nottingham School of Pharmacy's Research Ethics Officer.

Name of principal investigator/project supervisor:	Dr Stephanie Bridges, Dr Naoko Arakawa		
Signature:	Parages	ModegArabana	
Date:	04.07.19	05.07.19	

Please now save your completed form, print a copy for your records, and then email a copy to the Research Ethics Officer, at PA-PHARM-ETHICS@exmail.nottingham.ac.uk. As noted above, please do not submit a paper copy.

Acknowledgment: This form is based on a form used by the University of Birmingham for their Research Ethics Approval (version 25/02/2015), with their consent.

Appendix 2: Interview schedule for the professional group

Interview Schedule Policy makers and practice pharmacists

1- Background information

- 1. What is your professional background?
- 2. Please describe your current role in your institution and how long have you been working there?

2- Healthcare needs

- 1. In your opinion, what are the most prevalent healthcare needs in Saudi Arabia?
 - a. Can you prioritize them?

3- Pharmacists' roles

- 1- Can you describe what the pharmacist does in the healthcare system? And what are the services provided by them?

 - a. Can you prioritize them? And why do you think that is a top priority?b. So, out of the service and roles that you've mentioned, what is missing?
 - c. What are the tasks of the pharmacists within your institution?
- 2- How do you think the public are seeing the pharmacists currently?
 - i. What do you think is the public expectations of pharmacists (or what do people want the pharmacists to be able to do (currently) or to be able to do (in the future)?

4- Roles of pharmacists based on 2030 changes

- 1. Are you aware of the future 2030 vision with regard of the healthcare system?
- 2. If yes, define what the 2030 vision means to you? (your understanding of it)

If, No:

A brief definition of 2030 vision will be provided to the informant in order to proceed to the next questions.

(Saudi vision 2030 aims to provide efficient healthcare services through improving the quality of healthcare services and facilities while optimizing available resources thereby boosting opportunities for increased private sector participation)

- 3. Based on 2030 changes:
 - a. Do you think that people's current healthcare needs will change with the future vision? If so, in what ways?
 - b. Do you think that we will have new healthcare needs with the new changes of the vision? Give examples?
 - How do you think that is going to affect the pharmacists' current responsibilities? In what ways?
 - d. How does that affect what services need to be provided?
 - e. Specifically, what do you think the new service look like? f. Do you think that it would affect your role? if so, how?

An exploration of the suitability of pharmacy education in Saudi Arabia to prepare graduates to meet healthcare needs- Professionals interview schedule- 05/10/2019

Appendix 3: Interview guide for the public group

<u>Interview Schedule</u> <u>For the public focus groups</u>

1- Healthcare needs

- 1. Please describe your healthcare needs?
- 2. Please describe the healthcare needs of any other people you know?
- 3. More generally, what do you think are the healthcare needs of the public?

2- Pharmacists' roles

- 1. How often do you see a pharmacist and where?
 2. What are the main services that you or others need from the pharmacist?
 3. What do you expect from the pharmacists?
- 4. What makes good pharmacist?
- 5. What would you like the pharmacist to do for you/ others?
- 6. Describe your experience of dealing with a pharmacist (good/not so good)? And what did you get from that?
- 3- A chance for any other comments about healthcare or pharmacy



An exploration of the suitability of pharmacy education in Saudi Arabia to prepare graduates to meet healthcare needs- Pubic interview schedule- 25/09/2019

Appendix 4: Consent and demographics form of the professional group



Participant's name (BLOCK

Researcher's name (BLOCK

CAPITAL)

CAPITAL)

Division of Pharmacy Practice and Policy School of Pharmacy East Drive Nottingham NG7 2RD

Date

Date

Participant Consent Form

Title of Study: An exploration of the suitability of pharmacy education in Saudi Arabia to prepare graduates to meet healthcare needs Researcher's name: Salihah Alfaifi Supervisor's name: Stephanie Bridges & Naoko Arakawa In signing this consent form I confirm that: ☐ I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. \square I have had the opportunity to ask questions. ☐ I understand the purpose of the research project and my involvement in it. ☐ I understand that my participation is voluntary and I may withdraw from the research project at any stage, without having to give any reason and withdrawing will not penalize or disadvantaged me in any way. ☐ I understand that while information gained during the study may be published, any information I provide is confidential and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. ☐ I agree that extracts from the interview may be anonymously quoted in any report or publication arising from the research $\ \square$ I understand that the interview will be recorded using an electronic voice recorder ☐ I understand that data will be securely stored ☐ I understand that the information provided can be used in other research projects which have ethics approval, but that my name and contact information will be removed before it is made available to other researchers. ☐ I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Officer of the School of pharmacy, University of Nottingham, if I wish to make a complaint relating to my involvement in the research. ☐ I agree to take part in the above research project.

Participant's signature

Researcher's signature

Division of Pharmacy Practice and Policy School of Pharmacy East Drive Nottingham NG7 2RD

		Participant information
•	Gender	
		Male
		Female
•	Age	
		20 –30 years
		31 – 40 years
		41-50 years
		51-60 years
		≥ 61 years
•	Educati	on
		Bachelor's degree
		PharmD
		Residency training
		Master's degree
		PhD
•		ional background, e.g. pharmacy, medicine, etc.
•	Type of	practice, e.g. hospital, community, etc.
•	Institut	ion
•	Years w	orking in current area of practice
		≤ 5 years
		6-10 years
		11-20 years
		21–30 years
		≥ 31 years
•	Years q	ualified as a pharmacist:
•	Contact	t details:
	Mobile	number:
	E-mail:	

Appendix 5: Consent and demographics forms of the public group



CAPITAL)

CAPITAL)

Researcher's name (BLOCK

Division of Pharmacy Practice and Policy School of Pharmacy East Drive Nottingham NG7 2RD

Participant Consent Form

Title of Study: An exploration of the suitability of pharmacy education in Saudi Arabia to prepare graduates to meet healthcare needs Researcher's name: Salihah Alfaifi Supervisor's name: Stephanie Bridges & Nacko Arakawa In signing this consent form I confirm that: ☐ I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. \square I have had the opportunity to ask questions. $\hfill \square$ I understand the purpose of the research project and my involvement in it. ☐ I understand that my participation is voluntary and I may withdraw from the research project at any stage, without having to give any reason and withdrawing will not penalize or disadvantaged me in any way. ☐ I understand that while information gained during the study may be published, any information I provide is confidential (except for the focus group members) and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. ☐ I agree that extracts from the focus group may be anonymously quoted in any report or publication arising from the research $\ \square$ I understand that the focus group will be recorded using an electronic voice recorder ☐ I understand that data will be securely stored ☐ I understand that the information provided can be used in other research projects which have ethics approval, but that my name and contact information will be removed before it is made available to other researchers. ☐ I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Officer of the School of pharmacy, University of Nottingham, if I wish to make a complaint relating to my involvement in the research. ☐ I agree to take part in the above research project. Participant's name (BLOCK Participant's signature Date

Researcher's signature

Date

Division of Pharmacy Practice and Policy School of Pharmacy East Drive Nottingham NG7 2RD

Participant information

•	Gende	r
		Male
		Female
•	Age	
		18-30 years
		31 – 40 years
		41-50 years
		51-60 years
		≥ 61 years
•	Educat	tion
		None
		Primary
		Intermediate
		Secondary
		University
•	Currer	ntly under the treatment of any health issues
		Yes
		No
•	Emplo	yment status
		Student
		Employee in the governmental or the private sector
		Self-employed
		Retired
	Ц	House wife
		Not working
		Others, please specify
٠	0.50	fliving:

٠	Contac	ct details:
	Mobile	number:
	E-mail	t

GbCF applicability survey in Saudi Arabia

Page 1: Participant Information Sheet

Background

Competency is defined as a subset of outcomes: knowledge, skills, attitudes and personal qualities essential to the practice of the healthcare profession at the desired level 1 . A competency framework (CF) here refers to a set of competencies and associated behaviours required for effective performance in practice 2 .

1) ALBANESE, M. A., MEJICANO, G., MULLAN, P., KOKOTAILO, P. & GRUPPEN, L. (2008). Defining characteristics of educational competencies. *Medical Education*, 42, 248-255.

2) MILLS, E., FARMER, D., BATES, I., DAVIES, G., WEBB, D. & MCROBBIE, D. (2005). Development of an evidence-led competency framework for primary care and community pharmacists. *Pharmaceutical Journal*, 275, 48-52.

In an era of evolving healthcare transitions and demands, healthcare professionals must be equipped with appropriate skills and competencies to keep pace with these challenges to ensure a high standard of patient care delivery that will ultimately help to improve the health of individual patients and the wider population.

The use of competency frameworks for healthcare professionals is increasingly used globally. This project aims to develop a national competency framework to inform pharmacy education and to assist pharmacists in practice to assess and develop their capabilities and learning needs, in order to enhance patient outcomes. No national-level competency framework for pharmacists currently exists in Saudi Arabia.

The International Pharmaceutical Federation (FIP) Global Competency Framework (GbCF) 2012 sets standards for foundation level pharmacy practice and has been adapted by many countries for their own settings. The FIP GbCF will therfore form the basis of developing a competency framework for pharmacy in Saudi Arabia.

The purpose of this survey is to identify the competencies required for effective performance of pharmacists within all sectors of practice in Saudi Arabia by investigating the applicability of the FIP GbCF. This survey invites pharmacy practitioners in all fields of pharmacy practice in Saudi Arabia to participate.

This survey is part of a PhD project and is supported by the Saudi Council of Pharmacy Profession of the Saudi Council for Health Specialities (SCFHS).

If you have any questions or concerns about the survey, please contact Salihah Alfaifi (University of Nottingham: salihah.alfaifi@nottingham.ac.uk).

Page 2: Informed Consent Form

This study has been approved by the University of Nottingham School of Pharmacy Research Ethics Committee, ethics review No. 011-2019

Thank you for your interest in taking part in this survey.

This survey is anonymous and confidential. Your participation is voluntary. You can also withdraw from the survey at any time. However, please be aware that this data cannot be discarded if the analysed data has been published at the time of request for withdrawal.

You will be asked questions about 100 behavioural statements that constitute the provision of pharmaceutical services. The items are divided into four separate clusters: 'pharmaceutical public health', 'pharmaceutical care', 'organisation and management', and 'professional/personal'. The survey will take you approximately 20 minutes to complete.

In any published results of the survey, responses will be aggregated and anonymity will be maintained. Non-personal research data may also be used for future research.

All contributions are highly valued, and we appreciate your time and effort. If you have any questions or concerns about the survey, please contact Salihah Alfaifi (University of Nottingham: salihah.alfaifi@nottingham.ac.uk).

Electronic consent

Please select your choice below. By clicking the "agree" button, you indicate that:

- You have read the information above and in the cover page (previous page), and understand what the study involves.
 - You voluntarily agree to participate in the survey.
 - You are a registered pharmacist in Saudi Arabia. *

Required

C Agree				
○ Disagree				

Page 3: FIP Global Competency Framework Applicability Study in Saudi Arabia

Demographic Information
Please answer the following about yourself
Gender (Please tick one answer from the following) * Required
C Male C Female
Age (Please select one answer from the following dropdown list) * Required
Nationality (Please tick one answer from the following) * Required
C Saudi C Non-Saudi
All degree of education you have received (please tick ALL answer(s) from the following list) * Required
□ Bachelor's degree □ Pharm D

☐ Master's degree
☐ Residency training
□ PhD
□ Other
f you selected Other, please specify:
Years Qualified as a pharmacist (Please select one answer from the following dropdown ist) * Required
Current core area of practice (Please tick one answer from the following) * Required
C Community pharmacy
C Healthcare institute (Hospital)
C Healthcare institute (Primary health care)
© Academia
C Industrial pharmacy
© Regulatory and Public Health organisations
Regulatory and Public Health organisationsOther

6 / 30

Years working for current core area of practice (Please select one answer from the following dropdown list) * Required
Province of practice (Please select one answer from the following dropdown list) * Required
C Riyadh C Qassim Makkah Madinah Najran Eastern province Bahah Ha'il Tabuk Jawf Northern borders Jizan
Working experience in other area(s) of practice (Please tick ALL answer(s) from the following) Optional
 □ Community pharmacy □ Healthcare institute (Hospital) □ Healthcare institute (Primary health care) □ Academia
7 / 30

	☐ Industrial pharmacy
	☐ Pharmaceutical marketing
	Regulatory and Public Health organisations
	□ Other
ļ	
	If you selected Other, please specify:

Page 4: 1. Pharmaceutical Public Health

This cluster focuses on health promotion, medicines information and advice that pharmacists provide.

Please think only about your personal pharmaceutical practice and then rate each individual behavioural statement as highly relevant, relevant, low relevance, or not relevant to your practice.

Please answer all questions, reflecting actual practice rather than ideal or desired practice.

1.1 Health promotion * Required

	Highly relevant	Relevant	Low relevance	Not relevant
Assess the primary healthcare needs (taking into account the cultural and social setting of the patient)	Г	Г	Г	Г
Advise on health promotion, disease prevention and control, and healthy lifestyle	Г	Г	Г	Г

1.2 Medicines information and advice

	Highly relevant	Relevant	Low relevance	Not relevant	
--	-----------------	----------	------------------	-----------------	--

9 / 30

Counsel population on the safe and rational use of medicines and devices (including the selection, use, contraindications, storage, and side effects of non- prescription and prescription medicines)	Г	Г	Г	Г
Identify sources, retrieve, evaluate, organise, assess and disseminate relevant medicines information according to the needs of patients and clients and provide appropriate information	Г		Г	Г

Please add any comments and additional behaviours that you consider useful for this cluster.

Υ	Your answer should be no more than 500 characters long.						
L							

Page 5: 2. Pharmaceutical Care

This cluster focuses on the role of pharmacists in patient consultation and diagnosis, and assessing, compounding, dispensing and monitoring medicines.

Please think only about your own pharmaceutical practice and then rate each individual behavioural statement as highly relevant, relevant, low relevance, or not relevant to your practice.

Please answer all questions, reflecting actual practice rather than ideal or desired practice.

2.1 Assessmnet of Medicines

	Highly relevant	Relevant	Low relevance	Not relevant
Appropriately select medicines (e.g. according to the patient, hospital, government policy, etc.)	Г	Г	Г	Г
Identify, prioritise and act upon medicine-medicine interactions; medicine-disease interactions; medicine-patient interactions; medicines-food interactions	Г	Г	Г	Г

2.2 Compounding Medicines

Highly relevant	Relevant	Low relevance	Not relevant	8
relevant		relevance	relevant	

11 / 30

Prepare pharmaceutical medicines (e.g. extemporaneous, cytotoxic medicines), determine the requirements for preparation (calculations, appropriate formulation, procedures, raw materials, equipment etc.)	Г	Г	Г	Г
Compound under the good manufacturing practice for pharmaceutical (GMP) medicines	Г	Г	Г	Г

2.3 Dispensing

	Highly relevant	Relevant	Low relevance	Not relevant
Accurately dispense medicines for prescribed and/or minor ailments and monitor the dispense (re-checking the medicines)	П	Г	Г	Г
Accurately report defective or substandard medicines to the appropriate authorities	Г	Г	Г	Г
Appropriately validate prescriptions, ensuring that prescriptions are correctly interpreted and legal	Г	Г	Γ	Г
Dispense devices (e.g. inhaler or a blood glucose meter)	Г	Г	Г	Г
Document and act upon dispensing errors	Г	Г	Г	П

Implement and maintain a dispensing error reporting system and a 'near misses' reporting system	Г	Г	Г	Г
Label the medicines (with the required and appropriate information)	Г	Г	Г	Γ
Lear from and act upon previous 'near misses' and 'dispensing errors'	Г	Г	Г	П

2.4 Medicines

	Highly relevant	Relevant	Low relevance	Not relevant
Advise patients on proper storage conditions of the medicines and ensure that medicines are stored appropriately (e.g. humidity, temperature, expiry date, etc.)	Г	Г	Г	Γ
Appropriately select medicine formulation and concentration for minor ailments (e.g. diarrhea, constipation, cough, hay fever, insect bites, etc.)	Г	Г	Е	Е
Ensure appropriate medicines, route, time, dose, documentation, action, form and response for individual patients	Г	Г	Г	Г
Package medicines to optimize safety (ensuring appropriate repackaging and labeling of the medicines)	Г	Г	Г	Γ

2.5 Monitor Medicines Therapy

	Highly relevant	Relevant	Low relevance	Not relevant
Apply guidelines, medicines formulary system, protocols and treatment pathways	Г	Г	Г	Г
Ensure therapeutic medicines monitoring, impact and outcomes (including objective and subjective measures)	Г	Г	Г	Г
Identify, prioritize and resolve medicines management problems (including errors)	Г		Г	Г

2.6 Patient consultation and diagnosis

	Highly relevant	Relevant	Low relevance	Not relevant
Apply first aid and act upon arranging follow-up care	Г	Г	Г	Г
Appropriately refer	Г	П	Г	Г
Assess and diagnose based on objective and subjective measures	Г	Г	Г	Г
Discuss and agree with the patients the appropriate use of medicines, taking into account patients' preferences	Г	Г	Г	Г
Document any intervention (e.g. document allergies, medicines and food, in patient medicines history)	Г	Г	Г	Г

Obtain, reconcile, review, maintain and update relevant patient medication and diseases history	Г	Г	Г	Г

Please add any comments and additional behaviours that you consider useful for this cluster.

Your answer should be no more than 500 characters long.						

Page 6: 3. Organization and Management

This cluster focuses on the organisation and management related to budget and reimbursement, human resources, service improvement, procurement, supply chain and workplace.

Please think only about your own pharmaceutical practice and then rate each individual behavioural statement as highly relevant, relevant, low relevance, or not relevant to your practice.

Please answer all questions, reflecting actual practice rather than ideal or desired practice.

3.1 Budget and reimbursement

	Highly relevant	Relevant	Low relevance	Not relevant
Acknowledge the organisational structure	Г	Г	Г	Г
Effectively set and apply budgets				П
Ensure appropriate claim for the reimbursement	Г	Г	Г	Г
Ensure financial transparency	Г	Г	Г	Г
Ensure proper reference sources for service reimbursement	П	Г	Г	Г

3.2 Human Resources Managment

ant Low Not relevant	
Э	nt .

Demonstrate organisational and management skills (e.g. know, understand and lead on medicines management, risk management, self management, time management, people management, project management, policy management)	Г		Г	Г
Identify and manage human resources and staffing issues	Г	П	Г	Г
Participate, collaborate, advise in therapeutic decision-making and use appropriate referral in a multi-disciplinary team	Г	Г	Г	Г
Recognize and manage the potential of each member of the staff and utilize systems for performance management (e.g. carry out staff appraisals)	Г	Г	Г	Г
Recognize the value of the pharmacy team and of a multidisciplinary team	Г	Г	Г	Г
Support and facilitate staff training and continuing professional development	Г	Г	Г	Г

3.3 Improvment of Service

	Highly relevant	Relevant	Low relevance	Not relevant
Identify and implement new services (according to local needs)	Г	Г	Г	Г

Resolve, follow up and prevent medicines related problems	Г			Г
---	---	--	--	---

3.4 Procurment

	Highly relevant	Relevant	Low relevance	Not relevant
Access reliable information and ensure the most cost-effective medicines in the right quantities with the appropriate quality	Г	Г	Г	Г
Develop and implement contingency plan for shortages	Г	Г	Г	Г
Efficiently link procurement to formulary, to push/pull system (supply chain management) and payment mechanisms	Г	Г	Г	Г
Ensure there is no conflict of interest	Г		Г	Г
Select reliable supplies of high- quality products (including appropriate selection process, cost effectiveness, timely delivery)	Г	Г	Г	Г
Supervise procurement activities	Г			Г
Understand the tendering methods and evaluation of tender bids	Г	Г	Г	Г

3.5 Supply Chain and Managment

Highly relevant Releva	nt Low Not relevant
------------------------	---------------------

Demonstrate knowledge in store medicines to minimise errors and maximise accuracy	Г	Г	Г	Γ
Ensure accurate verification of rolling stocks	Г	Г		Г
Ensure effective stock management and running of service with the dispensary	Г	Г	Г	Г
Ensure logistics of delivery and storage	Б		Г	Г
Implement a system for documentation and record keeping	Г	Г	Г	Γ
Take responsibility for quantification of forecasting	Г	Г	Г	Г

3.6 Workplace Managment

	Highly relevant	Relevant	Low relevance	Not relevant
Address and manage day to day management issues	Г			Г
Demonstrate the ability to take accurate and timely decisions and make appropriate judgments	Г	Г	Г	Г
Ensure the production schedules are appropriately planned and managed	Г	Г	Г	Г
Ensure the work time is appropriately planned and managed	Г		Г	Г

Improve and manage the provision of pharmaceutical services	Г	Г	П	Г
Recognize and manage pharmacy resources (e.g. financial, infrastructure)	Г	Г	Г	Г

Please add any comments and additional behaviours that you consider useful for this cluster.

,	Your answer should be no more than 500 characters long.				
Į					

Page 7: 4. Professional/Personal

This cluster focuses on the application of the professional responsibilities and personal development related to communication skills, continuing professional development (CPD), legal and regulatory practice, professional and ethical practice, quality assurance (QA) and research in the workplace, and self management

Please think only about your own pharmaceutical practice and then rate each individual behavioural statement as highly relevant, relevant, low relevance, or not relevant to your practice.

Please answer all questions, reflecting actual practice rather than ideal or desired practice.

4.1 Communication Skills

	Highly relevant	Relevant	Low relevance	Not relevant
Communicate clearly, precisely and appropriately while being a mentor or tutor	Г	Г	Г	Г
Communicate effectively with health and social care staff, support staff, patients, carer, family relatives and clients/customers, using lay terms and checking understanding	Г	Г	Г	Г
Demonstrate cultural awareness and sensitivity	Г	Г	Г	Г
Tailor communications to patient needs	Г		Г	Г

Use appropriate communication skills to build, report and engage with patients, health and social care staff and voluntary services (e.g. verbal and non-verbal)	Γ	Г	Г	Г
--	---	---	---	---

4.2 Continuing Professional Development (CPD)

	Highly relevant	Relevant	Low relevance	Not relevant
Document CPD activities	Г		Г	Г
Engage with students/interns/residents	Г	Г	Г	Г
Evaluate currency of knowledge and skills	Г	Г	Г	Г
Evaluate learning	Г			Г
Identify if expertise needed outside the scope of knowledge	Г	Г	Г	Г
Identify learning needs	П	П	Г	Г
Recognize own limitations and act upon them	Г	Г	Г	Г
Reflect on performance	Г			Г

4.3 Legal and Regulatory Practice

	Highly relevant	Relevant	Low relevance	Not relevant
Apply and understand regulatory affairs and the key aspects of pharmaceutical registration and legislation	Г	Г	Г	Γ

Apply knowledge in relation to the principals of business economics and intellectual property rights including the basics of patent interpretation	Г		Г	Г
Be aware of and identify the new medicines coming to the market	Г	Г	Г	Г
Comply with legislation for drugs with the potential for abuse	Г		Г	Г
Demonstrate knowledge in marketing and sales	Г		Г	Г
Engage with health and medicines policies	Г	Г	Г	Г
Understand the steps needed to bring a medicinal product to the market including the safety, quality, efficacy and pharmacoeconomic assessments of the product	Г	Г	Г	Г

4.4 Professional and Ethical Practice

	Highly relevant	Relevant	Low relevance	Not relevant
Demonstrate awareness of local /national codes of ethics	Г	Г	Г	Г
Ensure confidentiality (with the patient and other healthcare professionals)	Г	Г	Г	Г
Obtain patient consent (it can be implicit on occasion)	Г	Г	Г	Г
Recognize own professional limitations	Г	П	Г	Г

Take responsibility for own			
action and for patient care	l l		I

4.5 Qaulity Assurance and Research in the workplace

	Highly relevant	Relevant	Low relevance	Not relevant
Apply research findings and understand the benefit risk (e.g. pre-clinical, clinical trials, experimental clinical-pharmacological research and risk management)	Е			Г
Audit quality of service (ensure that they meet local and national standards and specifications)	Г	Г	Г	Г
Develop and implement Standing Operating Procedures (SOPs)	Г	Г	Г	Г
Ensure appropriate quality control tests are performed and managed appropriately	Г	Г	Г	Г
Ensure medicines are not counterfeit and quality standards		Г	Г	Г
Identify and evaluate evidence- base to improve the use of medicines and services	Г	Г	Г	Г
Identify, investigate, conduct, supervise and support research at workplace (enquiry-driven practice)	Г	Γ	Г	Г

Implement, conduct and maintain a reporting system of pharmacovigilance (e.g. report Adverse Drug Reactions)	Γ	Г	Г	Г
Initiate and implement audit and research activities	Г		Г	Г

4.6 Self-managment

	Highly relevant	Relevant	Low relevance	Not relevant
Apply assertiveness skills (inspire confidence)	Г	Г	Г	Г
Demonstrate leadership and practice management skills, initiative and efficiency	Г	Г	Г	Г
Document risk management (e.g. critical incidents)	Г	Г	Г	Г
Ensure punctuality	Г	Г	Г	Г
Prioritize work and implement innovative ideas	Г	П	Г	Г

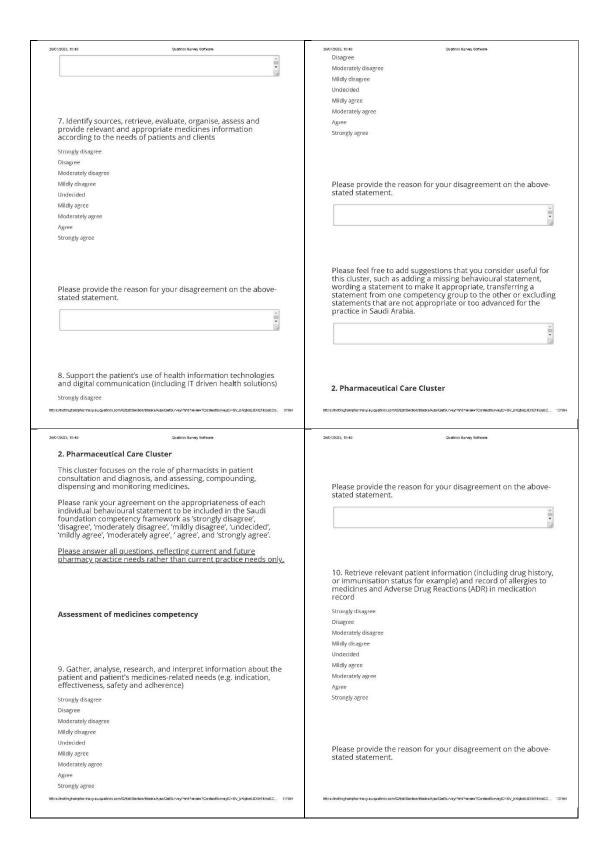
Please add any comments and additional behaviours that you consider useful for this cluster.

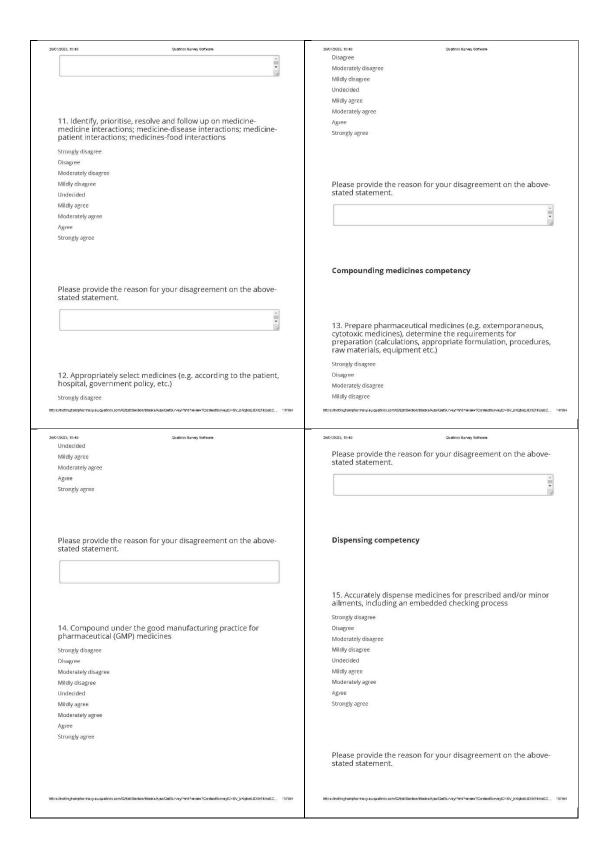
Your answer should be no more than 500 characters	long.

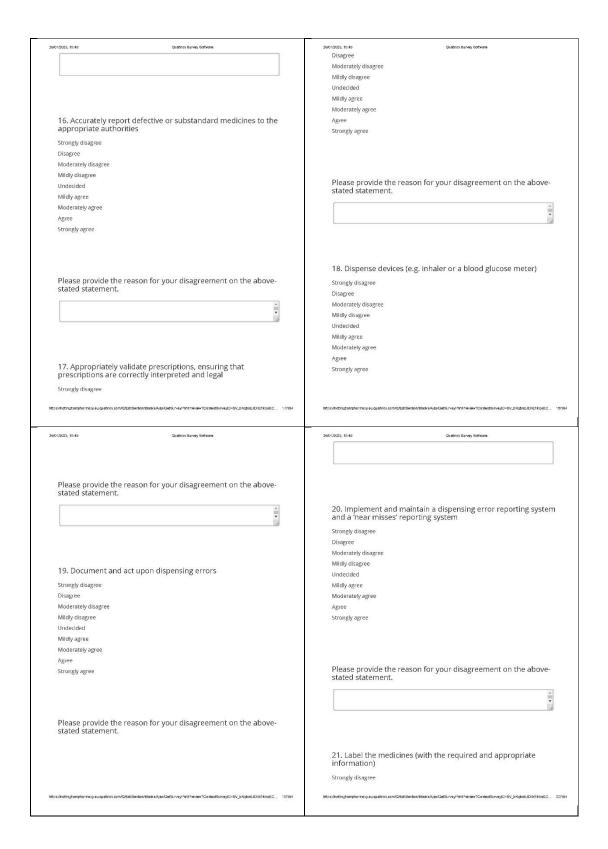
Appendix 7: Phase 2b survey

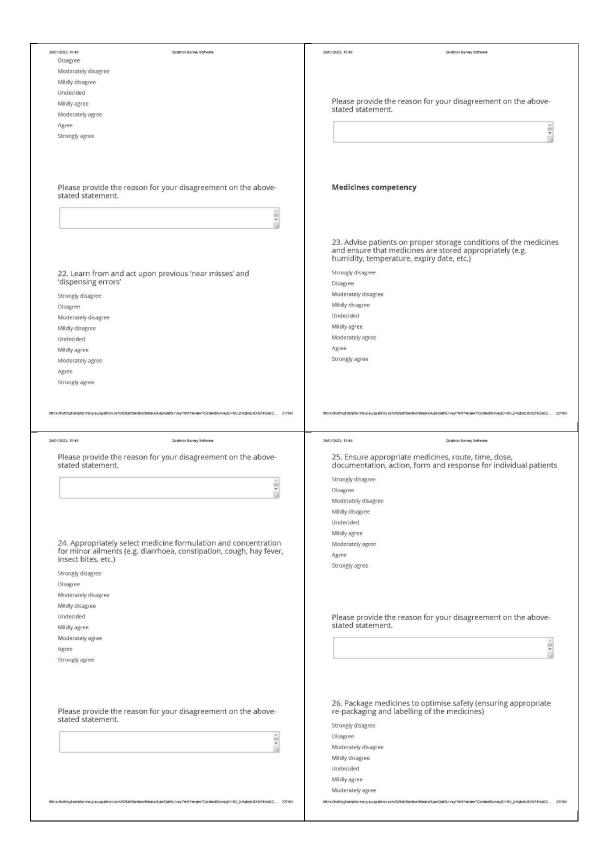
in Saudi Arabia. The GbCF will, therefore, form the basis of developing a competency framework for pharmacists in Saudi The purpose of this survey is to identify your agreement on the appropriateness of the FIP GbCF v2 behavioural statements to be included in the national foundation competency framework based on research findings from previous phases of this research. Click here to view results of the previous phases of this Information sheet-1 ldentification and description of core competencies required for the development of the Saudi Foundation Level Pharmacy Competency Framework The shift of pharmacy practice from being product-oriented to patient-centered care in the last few decades, implies an expansion in pharmaceutical services' scope and pharmacists' roles. To fulfill their expanded roles, the pharmacists need to be competent to deliver the full range of pharmaceutical service to keep pace with the evolving challenges of global health and the country's 2030 vision health system transitions as well as patients' expectations. Thus, it is crucial to identify the competencies required for pharmacists to qualify them to work effectively in the rapidly evolving healthcare system. This study has been approved by the University of Nottingham School of Pharmacy Research Ethics Committee (Ref.011-2019) and is supported by the Saudi Council of Pharmacy Profession of the Saudi Council for Health Specialties (SCFHS). The use of the competency frameworks in developing healthcare professionals is increasingly used globally. In 2012, the International Pharmaceutical Federation (FIP) developed an evidence-based Global Competency Framework (GbCF) to support the foundation level (or early career) practitioners' development worldwide. It includes a set of competencies and behavioural statements that can be used as a 'mapping tool' to develop country-specific frameworks based on the local needs of pharmacy practice and pharmacists' professional development. A number of countries, such as Ireland, Croatia, Singapore, Serbia and Kuwait, have used it successfully to develop their own country-specific frameworks for their in-service pharmacists as well as their pre-service education and training. This provides an evidence that FIP GbCF could be adapted to suit the country's local needs. Information sheet-2 Ranking of the International Pharmaceutical Federation (FIP) Global Competency Framework (GbCF v2) behavioural statements Thank you for your interest in taking part in this consensus panel You will be asked to rank your agreement on the appropriateness of 124 behavioural statements that constitute the provision of pharmaceutical services to be included in the Saudi foundation competency framework using a nine-point Likert scale: 'strongly disagree', 'disagree', 'moderately disagree', 'mildly disagree', 'undecided', 'mildly agree', 'moderately agree', 'agree', and 'strongly agree', 'agree', and 'strongly agree', 'moderately disagree', 'agree', and 'strongly agree', 'moderately agree', 'agree', and 'strongly agree', 'moderately agree', 'moderately agree', 'moderately agree', 'agree', and 'strongly agree', 'moderately agree', 'moderately agree', 'agree', 'moderately agree', 'moderately This project aims to develop a national competency framework to upgrade the pharmacy education process and assist the current practice pharmacists in evaluating their capabilities and learning needs to enhance practice and patient outcomes. Currently, no national-level competency framework is available for pharmacists 'strongly agree'. In addition, you will be asked to provide your reason for any of your responses if it was in the disagreement' category-either 'strongly disagree', 'disagree' or 'moderately disagree'. The 26/01/2023, 19:49 Quatrics Survey Software 'disagreement' responses will be aggregated from all consensus panel members to facilitate the discussion and clarification for each statement of disagreement in the panel meeting. The survey is divided into four broad competency clusters that comprise 23 competency domains, i.e. a subset of outcomes: knowledge, skills, attitudes and personal qualities essential to the practice of the pharmacy profession at the desired level. Each of these competency domains has a number of statements, known as behavioural statements, that define how that competency domains have the provided by the competency domains have a number of statements, known as behavioural statements, that define how that competency **Emergency response competency** would be recognised. The survey will take approximately 60 minutes to complete. 1. Participate in the response to public health emergencies All of your responses are confidential. Your participation is voluntary. You can also withdraw from the study at any time. Strongly disagree Disagree All contributions are highly valued, and we appreciate your time Moderately disagree Mildly disagre Undecided Mildly agree Moderately agree Agree 1. Pharmaceutical Public Health Cluster Strongly agree 1. Pharmaceutical Public Health cluster This cluster focuses on health promotion, medicines information, emergency response and advice that pharmacists provide. Please provide the reason for your disagreement on the above-stated statement. Please rank your agreement on the appropriateness of each individual behavioural statement to be included in the Saudi foundation competency framework as strongly disagree', 'disagree', 'moderately disagree', 'mildly disagree', 'undecided', 'mildly agree', 'moderately agree', 'agree', or 'strongly agree'. Please answer all questions, reflecting current and future pharmacy practice needs rather than current practice needs only. 2. Assist the multidisciplinary healthcare teams in emergency

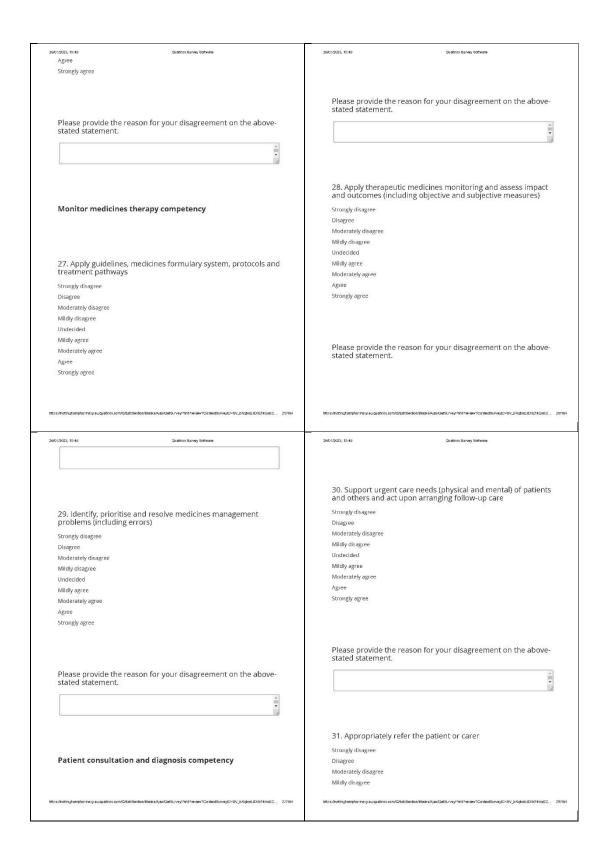
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situations	
Strongly disagree	Mildly disagree
Disagree	Undecided
Moderately disagree	Mildly agree
Mildly disagree	Moderately agree
Undecided	Agree
Mildly agree	Strongly agree
Moderately agree	
Agree	
Strongly agree	
	Please provide the reason for your disagreement on the above- stated statement.
	stated statement.
	A
Please provide the reason for your disagreement on the above-	
stated statement.	
	Advise and provide services related to health promotion; disease prevention and control (e.g. vaccination); and healthy
	lifestyle
Haalth muomatian samuatanas	Strongly disagree
Health promotion competency	Disagree
	Moderately disagree
	Mildly disagree
	Undecided
	Mildly agree
3. Assess the patient's/population's primary healthcare needs	Moderately agree
(taking into account the cultural and social setting of the patient/populations)	Agree
patient/populations/	Strongly agree
Strongly disagree	
Disagree	
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Please provide the reason for your disagreement on the above- stated statement.	
	Madiatus information and advice community
A	Medicines information and advice competency
5. Identify and support national and local health priorities and initiatives	Counsel the patient/population on the safe and rational use of medicines and devices (including the selection, use, contraindications, storage, and side effects of non-prescription
Strongly disagree	and prescription medicines)
Disagree Disagree	Strongly disagree
PROTEIN	Disagree
Moderately disagree	Moderately disagree
Mildly disagree	Mildly disagree
Undecided	Undecided
Mildly agree	
Moderately agree	Mildly agree
Agree	Moderately agree
Strongly agree	Agree
	Strongly agree
Please provide the reason for your disagreement on the above-	
stated statement.	Please provide the reason for your disagreement on the above-
	stated statement.
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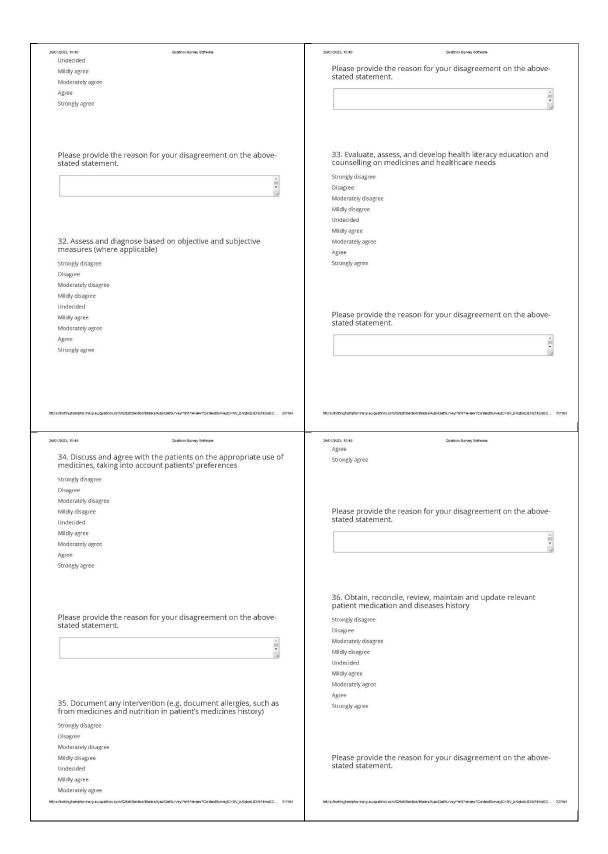




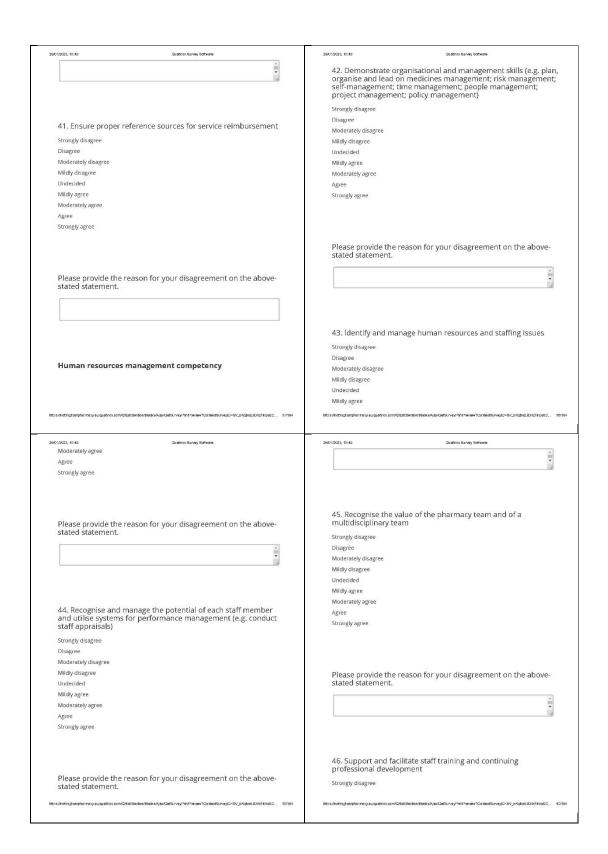








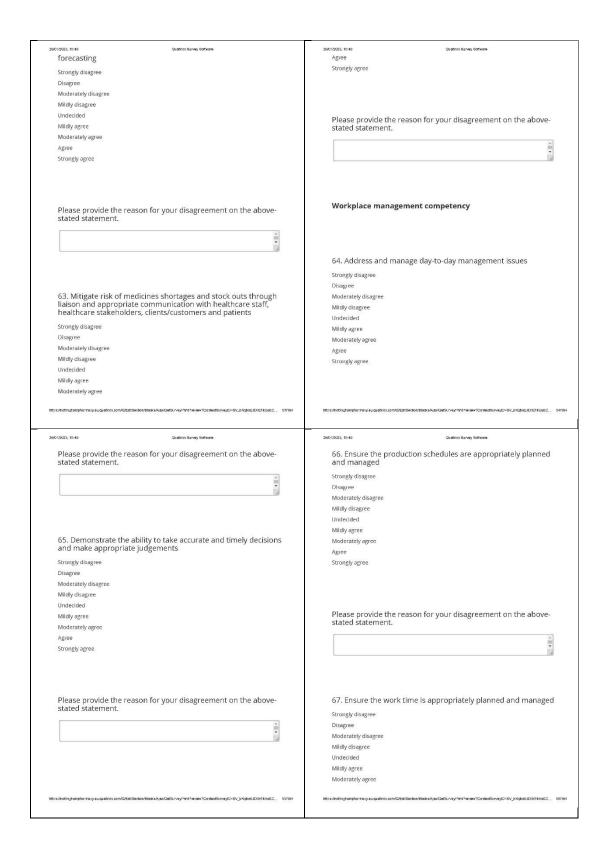
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172023, 10:40 Qualities Survey Software	26/01/2023, 10:40 Qualities Survey Software
	Budget and reimbursement competency
Please feel free to add suggestions that you consider useful for	
this cluster, such as adding a missing behavioural statement,	
wording a statement to make it appropriate, transferring a statement from one competency group to the other or excluding	
statements that are not appropriate or too advanced for the	37. Acknowledge the workplace organisational structure
practice in Saudi Arabia.	Strongly disagree
	Disagree
	Moderately disagree
	Mildly disagree
	Undecided
	Mildly agree
3. Organisation and Management Cluster	Moderately agree Agree
	Strongly agree
3. Organisation and Management Cluster	
This cluster focuses on the organisation and management related to budget and reimbursement, human resources, service	
improvement, procurement, supply chain and workplace.	
Please rank your agreement on the appropriateness of each	Please provide the reason for your disagreement on the above- stated statement.
individual behavioural statement to be included in the Saudi	stated statement.
foundation competency framework as 'strongly disagree', 'disagree', 'moderately disagree', 'mildly disagree', 'undecided',	
'mildly agree', 'moderately agree', ' agree', and 'strongly agree'.	
Please answer all guestions, reflecting current and future	
pharmacy practice needs rather than current practice needs only.	
30 2540	
	38. Effectively set and apply budgets
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Strongly disagree	2667/2023, 15-49 Children Survey Software
Control Custon Survey Software Strongly disagree Disagree Moderately disagree	2997/2003, 10-91 Sultres Survey Software
Strongly disagree Disagree	
Strongly disagree Disagree Moderately disagree Mildly disagree	Please provide the reason for your disagreement on the above-
Strongly disagree Disagree Middy disagree Middy disagree Undecided Mildy agree	
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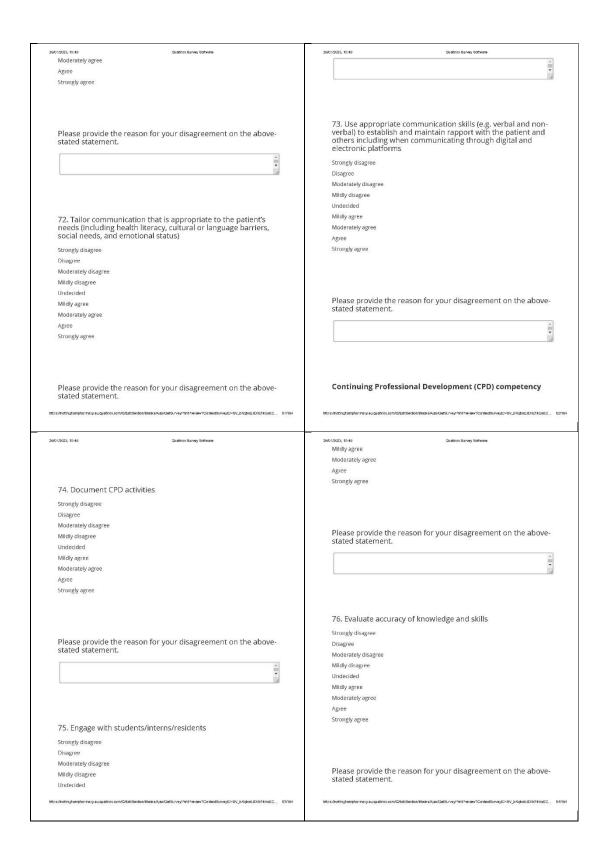
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	48. Resolve, follow up and prevent medicines related problems
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	Agree
47. Identify, implement and monitor new services (according to	Strongly agree
local needs)	8336 8
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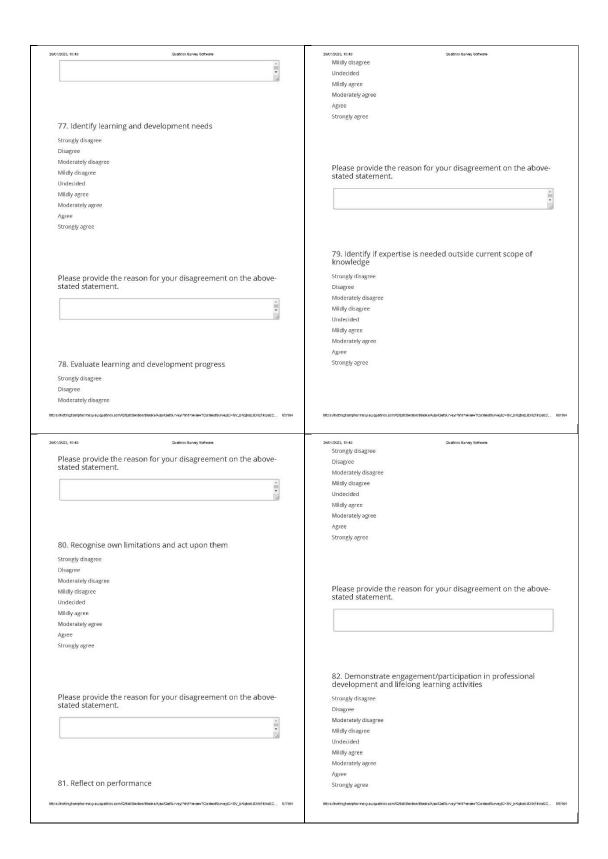
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	53. Identify and select reliable supplier(s)
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stated statement.	Disagree
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52. Ensure there is no conflict of interest	MAC AT THE STATE OF THE STATE O
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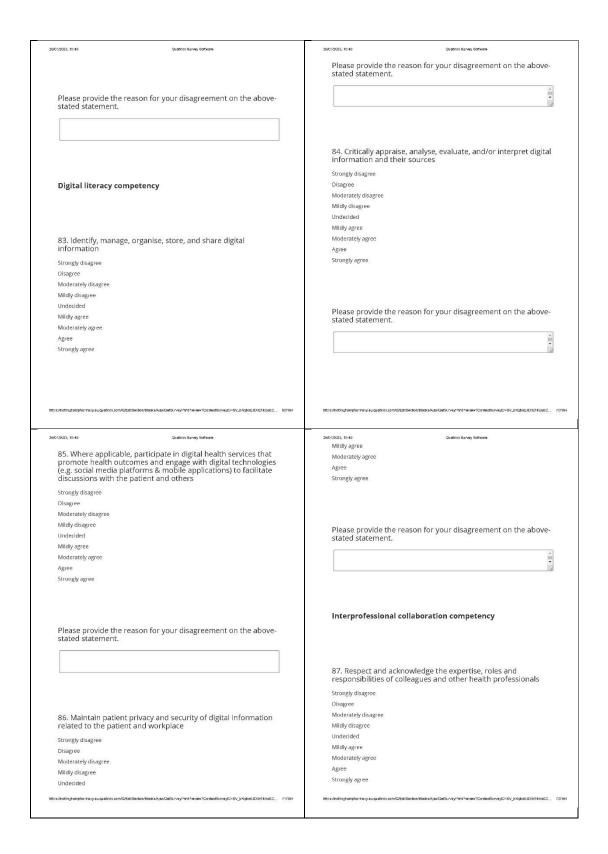
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Supply chain management competency	58. Verify the accuracy of rolling stocks
	Strongly disagree
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57. Demonstrate knowledge in store medicines to minimise errors and maximise accuracy	Undecided
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Agree	Please provide the reason for your disagreement on the above- stated statement.
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Please provide the reason for your disagreement on the above- stated statement.	
	59. Ensure effective stock management and running of service
	with the dispensary
	Strongly disagree
	Disagree
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	61. Implement a system for documentation and record keeping
Diamana di da tha anno a fancia a diamana da a tha abana	Strongly disagree
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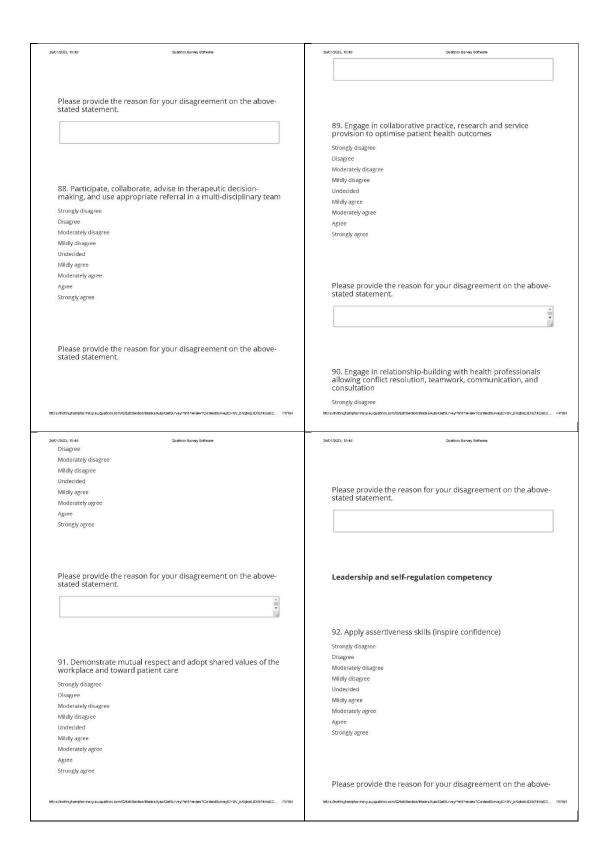


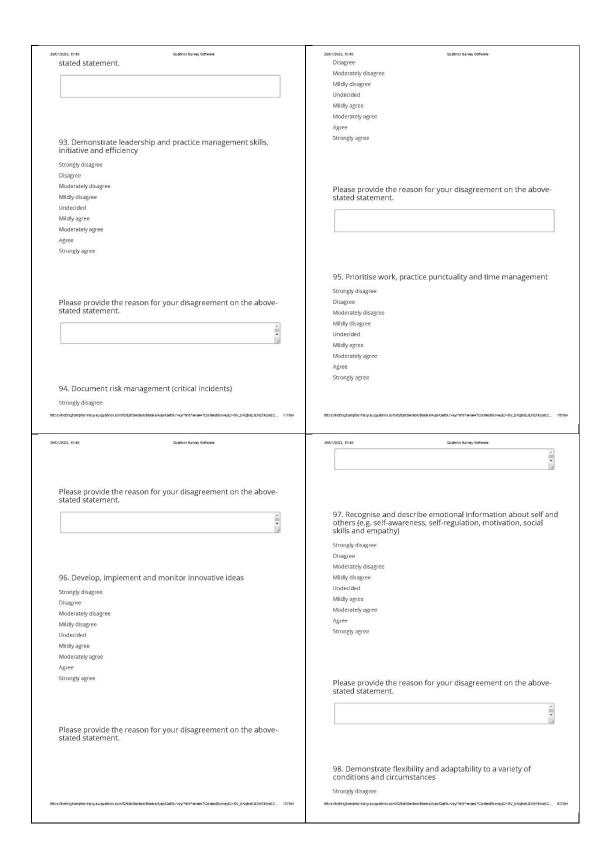
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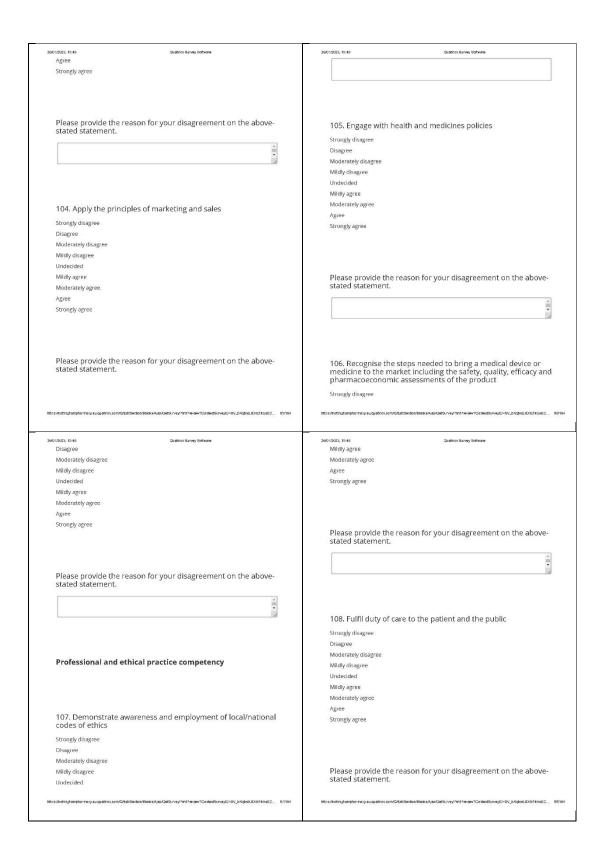


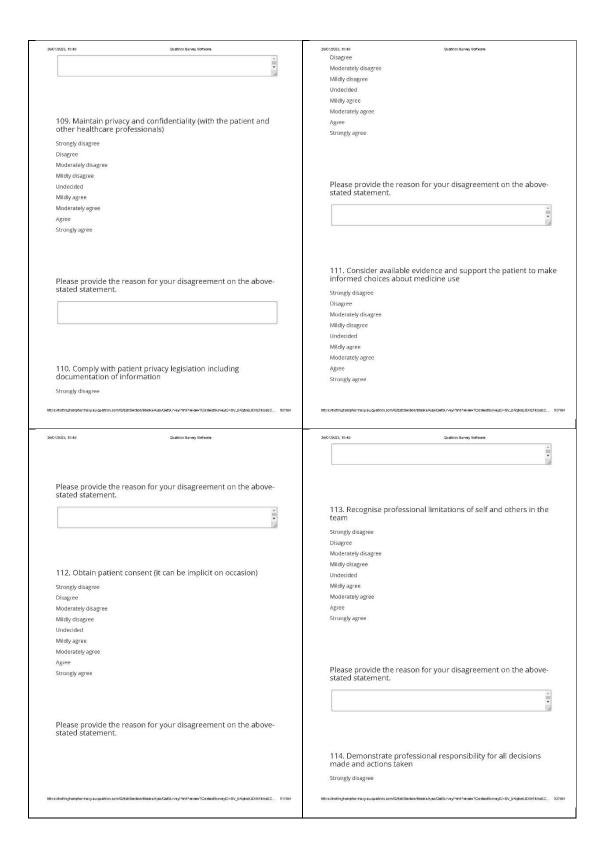


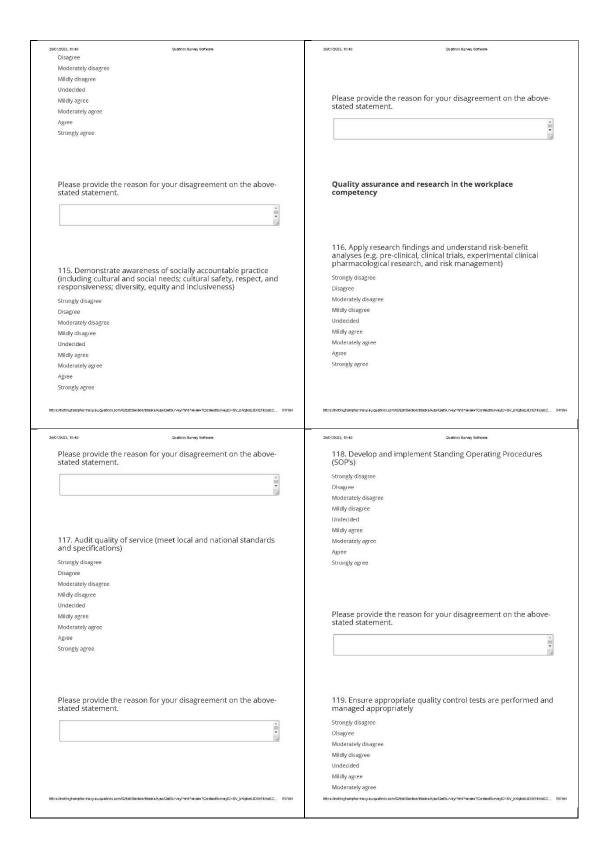


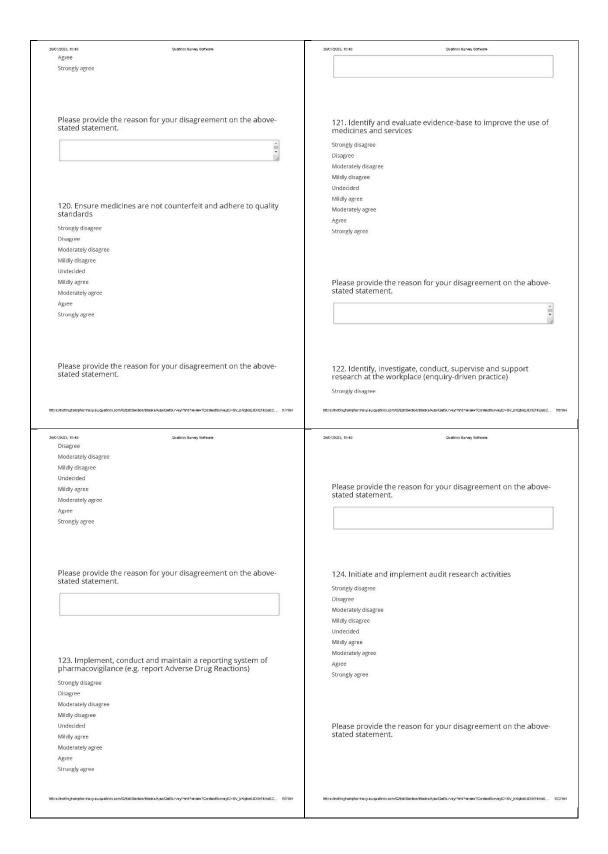


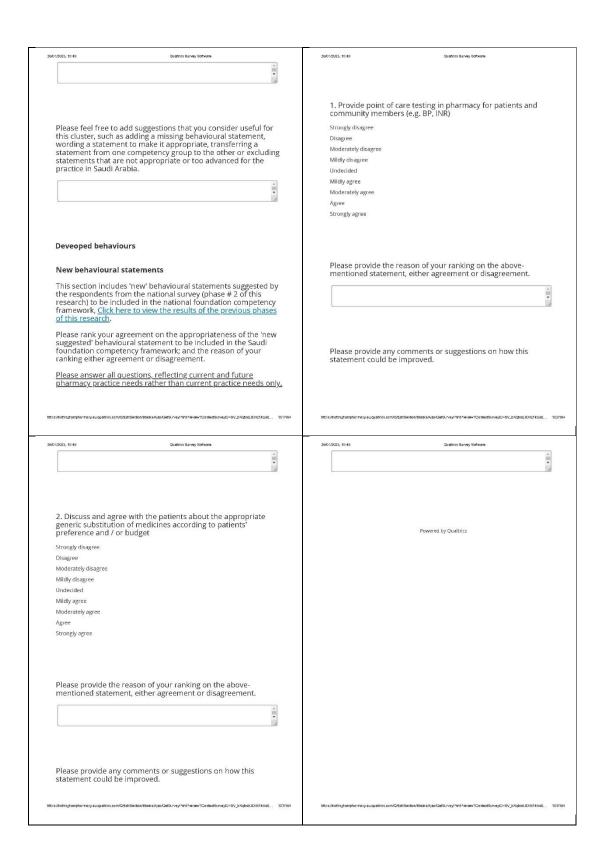
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Appendix 8: List of school A courses, credit hours and contact hours by study year

Year of study	Course name (School A)	Credit hours	Contact hours
	Medical terminology	2	28
	Mathematics for Pharmacy	3	42
	Human Biology	4	75
	Organic Chemistry	2	30
	Human Anatomy and Histology	4	60
Year 1	Introduction to Pharmacy Profession	1	15
	Biostatistics	2	28
	Pharmaceutical Organic Chemistry	4	75
	Pharmaceutical Microbiology	3	60
	Pharmaceutical Analytical Chemistry	4	75
	Biochemistry-1	2	30
	Physiology-1	3	58
	Phatmaceutics-1	3	58
	Pharmacognosy	2	56
	Computer for Health sciences	2	45
	Pharmacy Practice	2	30
Year 2	General Immunology	2	30
	Biochemistry-2	3	60
	Physiology-2	2	30
	Medicinal Chemistry-1	3	60
	Pharmacology-1	4	75
	Molecular Pharmacology	2	30
	Pharmaceutics-2	3	58
	Medicinal Chemistry-2	3	60
	Pathophysiology	2	30
	Pharmacology-2	4	75
Year 3	Chemotherapy	2	30
	Natural Products Chemistry	3	56
	Pharmacopeial Analysis	4	75
	Medicinal Chemistry-3	3	60
	Pathophysiology-2	2	30
	Pharmaceutics-3	3	58
	Pharmacology-3	3	58
	Scientific Writing and Seminar	1	15
	Pharmacotherapy-1	3	42
	Pharmacology-4	2	30
	Toxicology	2	30
Year 4	Pharmaceutical Biotechnology	2	28
, 53, 7	Basic Pharmacokinetics	2	45
	Dispensing of Medication	3	45
	Radiopharmacy	1	15

	Pharmacogenomics	2	30
	Biopharmaceutics	2	30
	Clinical Communication Skills	2	30
	Ethics in Pharmacy	2	30
	Pharmacotherapy-2	3	56
	Drug & Poison Information services & Literature Evaluation	3	70
	Over the Counter Drugs	2	28
	Patient Assessment and First Aid	1	45
	Pharmacotherapy-3	3	56
	Pharmacoeconomics & Epidemiology	3	42
	Pharmacy Management	2	30
Year 5	Evidence Based Pharmacy	2	45
	Pharmaceutical Care	2	30
	Applied Pharmacokinetics	2	42
	Clinical Nutrition & IV Administration	4	84
	Pharmacy Law	1	15
	Scientific Writing and Seminar-2	2	45
	Drug of Abuse	2	30
	Pharmacotherapy-4	3	56
	Graduation Project	2	45
Year 6	Pharmacy Practice-1 (In-patient/Out-patient)	3	200
	Clinical Nutrition and IV Admixture	3	200
	Cardiology	3	200
	Internal Medicine	3	200
	Critical Care	3	200
	Paediatrics	3	200
	Infectious Diseases	3	200
	Elective rotation	3	200
	Elective rotation	3	200
	Elective rotation	3	200

Appendix 9: List of school B courses, credit hours and contact hours by study year

Year of study	Course name (School B)	Credit hours	Contact hours
Year 1	English	6	165
	IT skills	3	60
	Fitness and health education	1	30
	University skills	3	45
	Biostatistics	3	60
	General zoology	3	60
	Physics	4	75
	Introduction to organic chemistry	3	60
	English	6	165
	Pharmaceutical calculation	3	75
	The introductory pharmacy practice experience-1	1	128
	Pharmaceutical organic chemistry	3	75
	Anatomy	3	75
	Biochemistry-1	2	30
	Physiology-1	3	45
Year 2	Basics of natural products	3	45
	Pharmaceuetics-1	3	75
	Medicinal chemistry-1	2	30
	Introduction to pharmacy profession	1	15
	Biochemistry-2	2	30
	Physicology-2	2	30
	Pharmaceutics-2	3	75
	Dietary Supplements	2	30
	The Introductory Pharmacy Practice Experience-2	1	128
	Pharmacy information Systems	2	60
37 - 4	Medicinal Chemistry-II	2	30
Year 3	Pharmacy Practice Lab-1	2	60
	Pharmacology-1	3	75
	The Introductory Pharmacy Practice Experience-3	2	512
	Pharmacy Practice lab-2	2	60
	Complementary and Alternative Medicine	3	45
	Drug Discovery	1	15
	General Immunology	2	30
	Pharmacology-II	3	75
	Introduction to Pathophysiology	2	30
	Pharmacy in Health System	2	30
Year 4	Pathophysiology and Therapeutics-1	2	30
	Pharmacy Practice Lab-3	2	60
	Pathophysiology and Therapeutics-2	2	30
	Evidence-based Herbal Medicine	1	15
		+_	+
	Clinical Microbiology	3	75

Biopharmaceutics and Pharmacokinetic 3 45 Pathophysiology and Therapeutics-3 2 30 Pharmacy Practice Lab-4 2 60 Pathophysiology and Therapeutics-4 2 30 Clinical Immunology 2 30 Pharmaceutical Biotechnology 2 30 Sterile & parenteral preparations 2 60 Toxicology 2 30 Pharmacy law and Ethics 2 30 Pharmacy law and Ethics 2 30 Pharmacy Practice Lab 5 2 60 The Introductory Pharmacy Practice Experience-4 2 512 Pathophysiology and Therapeutics-5 2 30 Pathophysiology and Therapeutics-6 2 30 Research design and Pharmacoepidemiology 3 75 Medication Therapy Management-1 2 30 Applied Pharmacokinetics 2 30 Pharmacy management and marketing 2 30 Pharmacy Practice Lab-6 2 60 Pharmacy Practice Lab-6 2 60 Project and Seminar 3 45 Drug Information/Literature evaluation 2 30 Medication therapy management-2 2 30 Critical care 3 No information 3 No information 4 Internal medicine-1 3 No information 4 Hospital administration 3 No information 5 Elective rotation 3 No information 5	
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