TURKISH REPUBLIC OF NORTH CYPRUS
NEAR EAST UNIVERSITY
HEALTH SCIENCES INSTITUTE

HOW PHARMACISTS CHECK THE APPROPRIATENESS OF A REFILL DRUG THERAPY IN JORDAN

MOTASEM MOHAMMAD ALSHDAIFAT

MASTER THESIS

A THESIS SUBMITTED TO THE GRADUATE INSTITUTE OF
HEALTH SCIENCES NEAR EAST UNIVERSITY

DEPARTMENT OF CLINICAL PHARMACY

Supervisor:
Assoc. Prof. Dr. ABDIKARIM ABDI

Northern Cyprus, Nicosia

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NEAR EAST UNIVERSITY

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DEDICATION

I dedicate my work to my mother's memory, my father, my sisters, my brothers, my friends, my professors, and to the good people of the island of Cyprus.

ACKNOWLEDGMENT

I extend my appreciation to my advisor Dr. Abdikarim Abdi for his support, encouragement, and valuable remarks.I express my deep sense of gratitude and profound respect to my friend and research co-advisor Dr. Mohmmad B. Nusair for believing in me and trusting me with the idea of this research, for his continuous support, his time, and for his encouragement at all stages of my postgraduate studies Furthermore, my sincere gratitude for the members of the thesis committee, Dr. Bilgen Basgut, and Dr. Tareq Mukattash, for their time and insightful comments.

TABLE OF CONTENTS

THESIS APPROVAL
Signed Plagiarism Form
DEDICATION ..... **ii**
ACKNOWLEDGMENT ..... **iii**
TABLE OF CONTENTS ..... **iv**
LIST OF TABLES ..... **viii**
LIST OF FIGURES ..... **ix**
LIST OF ABBREVIATIONS ..... **x**
ABSTRACT ..... **xii**
ÖZ ..... **xiv**

1. INTRODUCTION **1**
1.1 Background 1
1.2 The pharmacist's key responsibilities in the pharmaceutical care practice: 1
1.2.1 Meeting the patient's drug-related need 1
1.2.2 Identifying the patient's drug therapy problems 3
1.2.3 Prioritizing the patient's drug therapy problems 3
1.2.4 Settings individualized outcomes for every drug-related problem 3
1.2.5 Developing the patient's drug therapy plan 3
1.2.6 Developing the patient's monitoring plan 4
1.2.7 Designing a schedule for follow-ups 4
1.2.8 Documentation 4
1.3 The Chat Check Chart (CCC) model 4
1.4 Pharmacy practice in Jordan 5

2. LITERATURE REVIEW **6**
2.1 Pharmaceutical care Practice 6
2.1.1 Pharmacy practice 6
2.1.1.1 Development of pharmacy practice 6
2.1.2 Pharmaceutical care 7
2.1.2.1 The history of pharmaceutical care 8

2.1.2.2 Drug-related problems within the healthcare system 11
2.1.3 The practice of Pharmaceutical care 14
2.1.3.1 The philosophy of the practice 15
2.1.3.1.1 Social need 15
2.1.3.1.2 The practitioner responsibilities 15
2.1.3.1.3 An expectation of being patient-centered 16
2.1.3.1.4 Need to Function in the Caring Paradigm 16
2.1.3.2 The patient care process 17
2.1.3.2.1 Patient assessment 18
2.1.3.2.2 Care plan development 22
2.1.3.2.3 Follow-up evaluation 23
2.1.3.2.4 Documentation 24
2.1.3.3 The practice management system 25
2.1.4 Implementation of pharmaceutical care practice 25
2.1.5 Barriers to pharmaceutical care 29
2.2 Patient-Centered Care: 32
2.2.1 Patient-centered care in pharmaceutical care 33
2.2.2 Understanding the patients' concept of illness 34
2.2.3 The patient's medication experience 35
2.2.3.1 Using the patient's medication experience to optimize therapeutic outcomes 36
2.2.4 Practitioner-Patient relationship 36
2.3 Pharmacy in Jordan 37
2.3.1 Education 37
2.3.2 Pharmacy professional sectors in Jordan 38
2.3.2.1 Industrial pharmacy 38
2.3.2.2 Jordan Royal Medical Services (JRMS) 38
2.3.2.3 Clinical pharmacy 38
2.3.2.4 Community pharmacy 39
2.3.3 Pharmaceutical care practice in Jordan 41
2.3.3.1 Pharmaceutical care implementations in hospitals and outpatient clinics settings: 41
2.3.3.2 Pharmaceutical care implantations in the community pharmacy setting 45
2.3.4 Gaps in pharmaceutical care literature in Jordan 50
2.4 The objectives of the study 52

2.4.1 Impact on Patient Outcomes and the Healthcare System 52
2.4.2 Pharmacy Education: 53
2.4.3 Pharmacy Practice Research 53
2.4.4 Objectives 53

3. METHODOLOGY 55
3.1 Study design 55
3.2 Sample 55
3.3 Procedure 55
3.4 Simulated case scenario 55
3.5 The questionnaire 56
3.6 Ethical approval 56
3.7 Data collection 56
3.8 Data analysis 57
3.8.1 Quantitative analysis 57
3.8.2 Qualitative analysis 58
3.9 Validation 58
3.9.1 The questionnaire 58
3.9.2 The simulated case scenario 58

4. RESULTS 59
4.1 Quantitative Study Results 59
4.1.1 Participants' demographics 59
4.1.2 Pharmacists' general attitude to pharmaceutical care 60
4.1.3 Perceived barriers to pharmaceutical care practice 62
4.1.4 Patient care process 64
4.1.4.1 Assessment process 64
4.1.4.2 Care plan 66
4.1.4.3 Follow-up 66
4.1.5 The pharmacotherapy workup 69
4.1.5.1 levothyroxine 69
4.1.5.2 Calcium supplement 70
4.2 Qualitative Study Results 73
4.2.1 Thematic analysis 73

4.2.1.1 Assumptions 73
4.2.1.2 Missed opportunities 75
4.2.1.3 Why to check 77

5. DISCUSSION 79
5.1 Discussion 79
5.2 Recommendations 84
5.3 Limitations 85

6. CONCLUSION 86
6.1 Conclusion 86
7. REFERENCES 88
APPENDIX 103

LIST OF TABLES

Table 2.1 Strand drug-related problems categories 12

Table 4.1 Participant pharmacists' demographics 59

Table 4.2 Pharmacists' general attitude to pharmaceutical care 61

Table 4.3 Perceived barriers to pharmaceutical care practice 63

Table 4.4 Patient care process steps 67

Table 4.5 Prime questions 68

Table 4.6 Pharmacotherapy workup 72

LIST OF FIGURES

Figure 2.1 Pharmaceutical care paradigm 14

Figure 2.2: Patient care process 17

LIST OF ABBREVIATIONS

Abbreviation	Description
A1c	Hemoglobin A1C
AACP	American Association of Colleges of Pharmacy
ADRs	Adverse drug reactions
AIDS	*Acquired Immune Deficiency Syndrome*
APhA	American Pharmaceutical Association
ASHP	American society of hospital pharmacists
CCC	Chat Check Chart
CKD	Chronic Kidney Diseases
COPD	Chronic Obstructive Pulmonary Disease
DAP	Data-Assessment-Plan
DRPs	Drug-related Problems
EBM	Evidence-Based Medicine
etc	Et cetera
FDA	Food and Drug Administration
INR	International Normalized Ratio
IRB	Institutional Review Board
JRMS	Jordan Royal Medical Services
JUST	Jordan University of Science and Technology
LDL	Low-Density Lipoprotein
LDL-C	Low-Density Lipoprotein Cholesterol

MMR	Medication Management Review
NTI	Narrow Therapeutic Index
Nvivo	Navigating viewpoints, images and value observed
PCG	Pharmaceutical Care Group
PCNE	Pharmaceutical Care Network Europe
PharmD	Doctor of Pharmacy
PQ1	Prime Question one
PQ2	Prime Question Two
PQ3	Prime Question Three
PTW	Pharmacotherapy Workup
PWDT	Pharmacist's Workup of Drug Therapy
RPh	Pharmacist
SD	Standard Deviation
SOAP	Subject-Object-Assessment-Plan
SPSS	Statistical Package for the Social Sciences
TRPs	Treatment-Related Problems
UCG	Usual Care Group
UK	United Kingdom
US	United States
WHO	World Health Organization

How Pharmacists Check The Appropriateness Of A Refill Drug Therapy In Jordan

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Advisor: Assoc. Prof. Dr. Abdikarim Abdi
Department: Clinical pharmacy

ABSTRACT

Background: Pharmacists are the most accessible and feasible members of the healthcare team. Therefore, pharmacists are well-positioned and equipped with the knowledge to detect, resolve, and prevent drug-related problems by ensuring that drug therapy is indicated, effective, safe, and most suitable. Drug-related problems burden the patient and the healthcare system with adverse therapeutic outcomes, reduced quality of life, and increased costs. Most drug-related problems are reported to be identifiable by pharmacists, hence; preventable.

Objectives: To observe and describe how pharmacists in Jordan deploy their cognitive thinking to ensure the appropriateness of drug therapy in their pharmacy setting. In addition, this study aimed to investigate pharmacists' stand towards the pharmaceutical care concept and the perceived barriers to the provision of pharmaceutical care services in Jordan.

Methods: A descriptive mixed methods study (quantitative and qualitative) was conducted. A simulated case scenario was used in this study to analyze how pharmacists use the pharmacotherapy workup to check a refill drug therapy appropriateness. A questionnaire-based survey was used to examine pharmacists' general knowledge, attitudes towards pharmaceutical care, and what are the perceived barriers.

Results: Twenty-six pharmacists took part in the study, all working for the same chain pharmacy. All the pharmacists had positive attitudes towards the concept of pharmaceutical care. Furthermore, pharmacists believed that pharmaceutical care is the right direction for the pharmacy profession. Lack of training, lack of private areas, and physician rejection were the most reported perceived barriers by the pharmacists. Pharmacists primarily focused on eliciting information about the patient's medication

and clinical history. The majority of pharmacists checked form medication indication, however poorly checked for effectiveness, safety, and manageability. Three overarching themes described how pharmacists checked the appropriateness of a refill drug therapy: assumptions, missed opportunities, and why to check.

Conclusion: The majority of pharmacists performed a superficial, incomplete checking of the appropriateness of drug therapy. Pharmacists were biased against checking a refill therapy appropriateness. A bias against checking the appropriateness of a dietary supplement was also reported. Pharmacists used assumptions to navigate the assessment process while missing opportunities for a further accurate assessment.

Key words: Mixed methods; Patient assessment; Pharmacotherapy workup; Jordan; Consultation; Community pharmacy; refill.

Eczacılar Ürdün'de Dolum İlaç Tedavisinin Uygunluğunu Nasıl Kontrol Etmektedir

Öğrencinin adı: Motasem Mohammad AlShdaifat

Danışman: Doç. Abdikarim Abdi

Bölüm: Klinik Eczacılık

ÖZ

Araştırmanın Temeli: Eczacılar, sağlık ekibinin en erişilebilir ve en uygun üyeleridir. Dolayısıyla eczacılar, ilaç tedavisinin belirgin, etkili, güvenli ve en uygun olmasını sağlayarak ilaçla ilgili sorunları tespit etme, çözme ve önleme bilgisi ile iyi konumlanmış ve donanımlıdır. İlaçla ilgili sorunlar, hasta ve sağlık sistemi açısından olumsuz terapötik sonuçlar, düşük yaşam kalitesi ve artan maliyetler gibi sorunlara yol açmaktadır. İlaçla ilgili sorunların çoğunun eczacılar tarafından tespit edilebildiği bildirilmektedir, dolayısıyla; önlenebilir.

Amaçlar: Bu araştırmada, Ürdün'deki eczacıların, eczane ortamında ilaç tedavisinin uygunluğunu sağlamak için bilişsel düşüncelerini nasıl uyguladıklarını gözlemlemek ve açıklamak amaçlanmıştır. Ayrıca, bu çalışma, eczacıların farmasötik bakım kavramına karşı duruşunu ve Ürdün'de farmasötik bakım hizmetlerinin sağlanmasında algılanan engelleri araştırmayı amaçlamaktadır.

Yöntem: Tanımlayıcı bir karma yöntem çalışması (nicel ve nitel) yapılmıştır. Bu çalışmada, eczacıların bir dolum ilaç tedavisinin uygunluğunu kontrol etmek için farmakoterapi çalışmasını nasıl kullandıklarını analiz etmek üzere simüle edilmiş bir vaka senaryosu kullanılmıştır. Eczacıların genel bilgilerini, farmasötik bakıma yönelik tutumlarını ve algılanan engellerin neler olduğunu incelemek için anket temelli bir araştırma yürütülmüştür.

Bulgular: Çalışmaya, hepsi aynı eczane zincirinde çalışan yirmi altı eczacı katılmıştır. Tüm eczacıların farmasötik bakım kavramına karşı olumlu tutumları olduğu görülmüştür. Ayrıca eczacılar, eczacılık mesleği için farmasötik bakımın doğru yön olduğuna inandıklarını belirtmiştir. Eczacılar tarafından en çok bildirilen engeller eğitim eksikliği, özel alanların olmaması ve hekim reddi olmuştur. Eczacılar öncelikle hastanın ilaç tedavisi ve klinik geçmişi hakkında bilgi edinmeye odaklanmışlardır.

Eczacıların çoğu ilaç endikasyonunu kontrol etmiş, ancak etkinlik, güvenlik ve yönetilebilirlik açısından yetersiz bir şekilde kontrol etmişlerdir. Üç kapsayıcı tema, eczacıların dolum bir ilaç tedavisinin uygunluğunu nasıl kontrol ettiklerini açıklamıştır: varsayımlar, kaçırılan fırsatlar ve nedenler kontrol edilmelidir.

Sonuç: Eczacıların çoğu, ilaç tedavisinin uygunluğunu yüzeysel ve eksik bir şekilde kontrol etmiştir. Eczacılar, dolum tedavisinin uygunluğunu kontrol etme konusunda önyargılıydılar. Bir diyet takviyesinin uygunluğunu kontrol etmeye karşı bir önyargı da rapor edilmiştir. Eczacılar, daha doğru bir değerlendirme için fırsatları kaçırırken değerlendirme sürecinde gezinmek için varsayımları kullanmışlardır.

Anahtar Kelimeler: Karma yöntem; Hasta değerlendirmesi; Farmakoterapi tetkiği; Ürdün; Konsültasyon; Serbest eczane; Dolum.

1. INTRODUCTION

1.1 Background

Nowadays, Pharmacists are taking new and expanded responsibilities in the scope of their practice. Over the last thirty years, pharmacy practice has shifted from being a product-centered practice to become a patient-centered practice(1).

Pharmacists worldwide are now providing pharmaceutical care services to their patients from; developing individualized care plans, medication reviews, patient education, patient counseling, assuring the appropriateness and effectiveness of drug therapy, medication management, and medication prescinding(2, 3).

Meanwhile, the pharmacy practice in Jordan is still mostly product-oriented, with a few individualized personal steps taken from community pharmacists, the government, private hospitals, and pharmacy chains to introduce and implement the pharmaceutical care services, and transfer the Jordanian practice to a patient-centered one(4-6).

The pharmaceutical care concept was introduced to the world as a concept that aims to take the pharmacy profession as a whole to a new level, marked by the transformation from being product-centered to be patient-centered. Hepler and Strand defined pharmaceutical care in their paper *"Opportunities and responsibilities in pharmaceutical care"* as: *"the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life"*(7).

The patient is considered the center of pharmaceutical care practice. The patient's needs, wants, personal preferences, beliefs, and best interest are the catalysts of the care process, and the pharmacist must navigate the care process in order to consummate them.

1.2 The pharmacist's key responsibilities in the pharmaceutical care practice:

1.2.1 Meeting the patient's drug-related need

The pharmaceutical care practice aims to identify and meet the patient's drug-related needs in a personal and individualized manner. The pharmacist must recognize the patient's needs, preferences, and personal beliefs, and develop their drug therapy based

on them. This is done through establishing the therapeutic relationship with the patient, where the patient is considered the main driver of the care process (8).

1.2.2 Identifying the patient's drug therapy problems

The pharmacist must identify, resolve, and prevent the patient's drug therapy problems, in order the achieve the intended outcomes of drug therapy. The pharmacist uses the therapeutic relationship, their clinical judgment, and, if needed, the help of other healthcare providers to identify, resolve, and prevent any drug therapy problems that might occur. The cause or causes of the drug therapy problems must be identified correctly in order to be resolved and prevented.

1.2.3 Prioritizing the patient's drug therapy problems

The pharmacist must prioritize the patient's drug therapy problems, and resolve them according to their clinical judgment, severity of the problem, and the patient's concerns and preferences. The pharmacist should include other healthcare providers whenever needed.

1.2.4 Settings individualized outcomes for every drug-related problem

The pharmacist must negotiate the outcomes for each drug-related problem with the patient. The outcomes must be realistic and achievable for the patient and their medical condition. The outcomes are classified into two classes: 1) clinical outcomes 2) pharmacotherapeutic outcomes.

Clinical outcomes may be one of five: cure of a disease, reduction or elimination of symptoms, halting the disease progression, preventing a disease or symptom, and return a physiologic sign to normal, while pharmacotherapeutic outcomes are related to problems by the drugs we used to treat the patient with (8).

1.2.5 Developing the patient's drug therapy plan

The care plan should be developed in a way that meets the clinical and therapeutic outcomes intended by the drug therapy and is in line with the patient's needs and preferences. The pharmacist must assess the drug therapy indication, effectiveness, safety, and the patient's ability and willingness to adhere and comply with it as

instructed. All the alternatives must also be taken into consideration by the pharmacist (9).

1.2.6 Developing the patient's monitoring plan

The pharmacist must develop a clear and defined monitoring plan in order to assess the clinical and therapeutic outcomes of drug therapy. The patient's signs, symptoms, laboratory results, and quality of life are used as parameters to assess the drug therapy plan (8).

1.2.7 Designing a schedule for follow-ups

The patient care process is a continuous process; therefore, follow-ups are imperative to guarantee the achievement of the intended outcomes out of the care process. Follow-ups are to be scheduled within a timeframe that allows for the intended impact of the drug therapy to occur. The drug therapy is evaluated during the follow-ups, as well as drug therapy-related problems(8).

1.2.8 Documentation

Documentation is imperative during every pharmacist-patient interaction. It helps pharmacists to understand what has been done throughout the care process, the reason behind it, and it facilitates communication with other healthcare providers(10).

1.3 The Chat Check Chart (CCC) model

The chat check chart model was developed by Lisa M. Guirguis in Alberta, Canada (11). The (CCC) model helps pharmacists to incept the patient care into their daily practice. The model consists of three steps: the first step is the "Chat" step, where the pharmacist gathers information from the patient "through chatting with them" using the three prime questions. the next step is the "Check" step, where the pharmacist evaluates the appropriateness of the drug therapy using the pharmacotherapy work-up, and the last step is the "Chart" step, which is the documentation step of the care process. This model has been used in the literature in a number of studies mainly done in Canada (11-13)

1.4 Pharmacy practice in Jordan

The pharmacy practice in Jordan is still mostly functioning in the traditional way, where the pharmacist's key responsibility is to dispense medications, with little to no patient-centered pharmaceutical care services provided. Although Jordanian pharmacists have expressed their support and willingness to provide patient-centered pharmaceutical care services in their practices (14, 15).

The positive impact on the implementation of various patient-centered pharmaceutical care services provided to patients in Jordan was assessed by several studies. The beforementioned studies assessed the pharmaceutical care services provided to patients in hospitals, outpatient clinics, and few community pharmacy settings. The patients had improved clinical and therapeutic outcomes, as well as a significant improvement in their quality of life (16). The barriers to the implementation of pharmaceutical care services in Jordan were also investigated by a number of studies with the need of pharmaceutical training was found to be the main barrier (14).

To this day, no studies have been carried out in Jordan to investigate the way Jordanian pharmacists check for the appropriateness of drug therapy using the pharmacotherapy workup. With that being said, we aim to investigate how pharmacists check the appropriateness of drug therapy in Jordan with this study.

2. LITERATURE REVIEW

2.1 Pharmaceutical care Practice

2.1.1 Pharmacy practice

2.1.1.1 Development of pharmacy practice

The pharmacy profession is ancient, one can say as ancient as the human civilization itself, early human civilizations used medicinal plants to treat the ill, as evidenced in some archaeological sites dating back five thousand years ago (17), and it kept developing with the evolution of the civilizations alongside the development of the other health sciences and professions.

Pharmacy was considered a hybrid discipline merging health science with the chemical sciences and oversees the safe use of medications. (18)

Pharmacy practice went through several stages from the early 1900s to modern days that had shaped the practice that we know at the present time.

In the beginnings of the past century, pharmacy practice embodied the role of apothecary by preparing drug products "*secundum artem*" for medicinal usage (18). During this period, the pharmacists' principal obligation was ensuring that the product is pure and unadulterated, although there was a secondary obligation which is providing sound advice to the customers (7).

During the fifties period, the large-scale manufacturing of medicinal products started; the pharmaceutical industry took over the drug preparing role of the pharmacist. The introduction of the American Pharmaceutical Association (APhA) code of ethics of "1922-1969" which barred the pharmacist from discussing "therapeutic effects or composition of a prescription with a patient," and the introduction of the "1951 Durham-Humphrey" amendment to the Food, Drug and Cosmetic Act(19), which introduced the prescription-only legal status for most effective therapeutic agents, downgraded the role of the pharmacist to a dispenser (7)

By the mid-sixties, pharmacists moved toward a more patient-oriented practice, and by that, the concept of clinical pharmacy was born(20). Pharmacists started exploring their full potentials and performing functions that were new to the pharmacy profession, which marked a time of rapid expansion of functions and increased professional diversity. Moving to the bedside resulted in more interactions between pharmacists and other health care providers, which helped pharmacy as a profession to restore its importance in medical care(7).

By the early nineties, pharmacists started adopting the pharmaceutical care model, which indicated that pharmacists are now taking on new responsibilities and accepting new accountabilities in providing medications to obtain definite outcomes and improving patients' quality of life.

Nowadays, a growing number of countries are adopting and embracing the new roles of pharmacists, as seen in the development of various prescribing models for pharmacists worldwide(2, 21), as many have shown support for it in hospitals throughout Canada(22). In the United States, forty states currently have their own regulations that allow collaborative drug therapy management provided by pharmacists(23). Meanwhile, across the Atlantic in England, supplementary prescribing provided by pharmacists was adopted since the early two-thousands (24).

2.1.2 Pharmaceutical care

Pharmaceutical care defined by Charles D. Hepler and Linda M. Strands as *"the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life"* (7). Pharmaceutical care started out in the latter part of the eighties, at those times an economic crisis hit the sanitary system of the United States which required a profound change in the pharmacy practice(25).

The principles of pharmaceutical care are driven from the central concept of *Good Pharmacy Practice*(26), and as they take inconsideration both of the patient-centered care and the economic part.

Pharmaceutical care sough to implement a rational and evidence-based pharmacotherapy, which in turn will benefit the patient, the community, and the practice.

2.1.2.1 The history of pharmaceutical care

Pharmaceutical care is a result of the evolution of the pharmacy practice that took place in the past sixty years, moving from a product-centered practice to a more patient-oriented practice established an environment that supported innovation and evolution in the daily practice of pharmacists around the world (27).

The introduction of *clinical pharmacy* in the sixties in some US-based hospitals did not only expand the domain of professional functions, but also resulted in several practice-based research which paved the way for an epochal patient-oriented practice(28), *clinical pharmacy* meant that pharmacists are in charge of meeting the drug-related needs of the health care team and the patient and committing to the optimization of the drug therapy, thus performing a professional judgmental role when it comes to patient drug-related outcomes(29), and for the past few decades hospitals around the world adopted the concept of *clinical pharmacy* recognizing the additive value of it(30, 31), in spite of the positive professional changes of *clinical pharmacy* many problems persisted within the healthcare system and with outpatient drug-use morbidities which are preventable in a more developed healthcare system (27).

In mid of the seventies, a report under the title of "*Pharmacists for the future*" also known as the *"Millis report"* which gained the support of the *American Association of Colleges of Pharmacy* (AACP), shed light on the rising disparity between the ongoing evidence-based advancement in pharmacotherapy and the level of knowledge regarding the usage of these advancements to achieve the optimal outcomes and limiting the inappropriate medication usage(32), and by that it urged to the involvement of pharmacists in the process of controlling rational drug-use. At the end of the seventies, the AACP alongside the American Pharmaceutical Association framed the *Standers of Good Pharmacy Practice*, which were applied for the concession of establishment licenses to pharmacists all over the United States (27).

In the mid of the eighties, the *Hilton Head Conference* witnessed the first introduction of the concept of pharmaceutical care by Charles D. Hepler and suggesting the idea that pharmacists could have a care-centered relationship just like other health care professionals (e.g., physicians, nurses), and that pharmacists have to be more involved

in the health care process and to take on more responsibilities regarding their role in achieving the outcomes of the therapy (27, 33).

The birth of the current concept pharmaceutical care was in nineteen eighty-eight when Strand, Cipolle, and Morley presented the pharmacy profession with the *Pharmacist's Workup of Drug Therapy* (PWDT), a practical instrument set to standardize the documentation of a clinical pharmacist's database, patient-care activities, and therapeutic plans. They stated that pharmacists, interns, residents, and students need a standard format to help with gathering and incorporating information about the patient, drugs, and diseases to practice a more efficacious patient-oriented pharmacy (27, 34). A year after, Hepler and Strand published an article entitled "*Opportunities and responsibilities in the Pharmaceutical Care*," which is considered the cornerstone for the current concept of pharmaceutical care. This article discussed drug-related morbidities and mortalities, which are often preventable, and it stated that the implementation of a pharmaceutical service would result in a reduction in the number of adverse drug reactions, shortening the length of stays, and reducing the cost of care. It also urged pharmacists to unite the front and indorse the patient-centered pharmaceutical care as their philosophy of practice (7, 27).

Hepler and Strand defined pharmaceutical care as *"the responsible provision of drug therapy to obtain definite outcomes in order to improve the patients' quality of life. "* This definition relies on three main points; a) Pharmacist has to take charge of the outcomes of the dispensed treatment, b) Pharmacist has to supervise and monitor the drug therapy in order to achieve the desired outcomes and c) In order to improve the patients' quality of life and to achieve the desired outcomes, the patient has to compromise. Furthermore, by this definition, the pharmacist role expanded far beyond only dispensing medication; pharmacists are now responsible for providing care, giving advice, and taking responsibility for drug therapy (27).

Three years after the arise of Hepler and Strand's definition of pharmaceutical care, the *American society of hospital pharmacists* (ASHP) stated that pharmaceutical care is *"the direct responsible provision of medication-related care to obtain definite outcomes in order to improve patients' quality of life"* (35).

In the first year of the last decade of the last century, the AACP adopted pharmaceutical care as "*pharmacy's mission for the 1990s"*, in which they emphasized overcoming the ``antagonism`` from the other health care providers, and more importantly the incomprehension and ignorance within the pharmacy profession(27, 36). Also, at the same, Strand *et al.* published an article under the title of *"Drug-related problems: Their structure and function,"* which helped the development of pharmaceutical care concept by identifying and categorizing (DRPs)(37), by familiarizing the pharmacy practice with the vocabulary used by other healthcare professions, and by assisting pharmacy practice standers development (27).

Meanwhile, in mainland Europe, the first mover towards pharmaceutical care was in nineteen ninety-two with the introduction of *"Research methods in Pharmaceutical care*," a course by the Danish College of Pharmacy Practice in Hillerod(38), and at the same year, the Royal Pharmaceutical Society advocated for the immediate adoption of pharmaceutical care in the United Kingdom. Two years later, *Pharmaceutical Care Network Europe* (PCNE) was created, an administrative platform for pharmaceutical care research and implementation in Europe.

The "*Minnesota Pharmaceutical Care Project (1992-1995)"*(39), was a very significant step taken by the *Department of Pharmacy Practice of the College of Pharmacy at Minnesota University* towards the establishment of the pharmaceutical care concept on the ground, the project was conducted to test if the community pharmacy practice can adapt to a new professional practice(40). The authors stated that pharmaceutical care has a beneficial impact on the patient and the health system(27). During the next year, the *International Pharmaceutical Federation* (FIP) conference in Tokyo strengthened the implementation of pharmaceutical care concept with the *World Health Organization* (WHO) documents regarding the pharmacist role in the healthcare system. Those documents underlined that the community pharmacy practice is now not only directed towards the patient but has expanded to provide services to the community under the influence of the pharmaceutical care philosophy, and that pharmaceutical care has a positive effect on the pharmaceutical cost, furthermore, the documents shed light on responsibilities multiple points such as the aging population of the world and its need for extensive healthcare, polypharmacy, and the increasing complexity of drug therapy which in turn means more effort and

are required from the pharmacist, and they also draw attention to the propensity to shorten hospitalization periods, at which pharmacists can play a huge role in.

By the new millennium, more countries with different backgrounds in pharmacy practice and culture adopted the pharmaceutical care philosophy, and by that, confusion arose about what pharmaceutical care term includes and how to differentiate it from other terms. Therefore the (PCNE) decided that a new modernized more inclusive definition for pharmaceutical care is needed, one that can work for different backgrounds and especially for Europe, and for that reason a workshop was held in Berlin with twenty-four pharmacists, fourteen of whom were members of PCNE, and after amending nineteen different definitions, it was agreed to redefine pharmaceutical care as: "*the pharmacists' contribution to the care of individuals in order to optimize medicines use and improve health outcomes."*(41).

2.1.2.2 Drug-related problems within the healthcare system

Drug therapy treatment is intended to improve the patients' quality of life and expand their life span. Accessibility to safe and effective medicines had improved the treatment and management process of illness, both acute and chronic. Any drug therapy treatment aims to achieve one or more of the following outcomes: a) cure of disease, b) elimination or reduction of patient`s symptomatology, c) arresting or slowing of a disease process, or d) preventing a disease or symptomatology (7).

Regardless of the enormous amount of knowledge available, a growing number of researches presented the health system with the fact that it was often failing to control and manage the risks of drug therapy, which in turn caused a reduction of patient's quality of life, death in some cases, lost productivity, an increase in hospitalization incidences, prolonged periods of hospitalization and an increase in the total cost of therapy(42-44). That being said, no individual profession, product, or the patient was to be blamed, rather it was a fault within the "*medicine use process*," which means: *"the sequence of actions and decisions usually used to deliver drug therapy"*(45).

The (WHO) defines drug-related problems DRPs as*:" any response to a drug which is noxious and unintended and which occurs at doses normally used in man for prophylaxis, diagnosis or therapy of disease, or for the modification of physiological function"*(46). Strand LM, Cipolle RJ, and Morley PC defined DRPs as:" *A drug*

therapy problem is any undesirable event experienced by a patient that involves, or is suspected to involve drug therapy, and that interferes with achieving the desired goals of therapy and requires professional judgment to resolve"(34, 47).

Drug-related Problems can be classified as either an actual drug problem or a potential one. The healthcare provider must establish a good relationship with the patient in order to fully determine and understand the patients' drug-related problem, and to explain to them the intervention that must be taken, as well as making them part of the drug therapy process. DRPs can be categorized into different categories, although those categories are not absolute, they can be split or merged, quite often a drug-related problem falls into two categories(37). The PCNE has a classification scheme for DRPs, it has six main problem domains and several sub-domains(48), while Strand categorized them into eight; Strand's categories (37):

Table 2.1 Strand drug-related problems categories

Strand's DRMs categories
Unnecessary drug therapy
Untreated condition
The patient is receiving too much dose of the correct drug
The patient is receiving too little dose of the correct drug
Adverse drug reactions
Patient lack of knowledge on how to use the drug
The patient needs drug therapy, but he/she is receiving the wrong drug
The patient is experiencing drug-drug or drug-food interactions

It was stated that two-thirds of U.S physicians' visits result in a new or renewed prescription(49). A meta-analysis of prospective studies which was conducted in the United States on hospitalized patients populations argued that the percentage of hospitalized patients with serious adverse drug reactions (ADRs) is as high as **6.7%**, with a fatality rate of **0.32%**(50), that would put ADRs as the fourth leading cause of death, ahead of pulmonary disease, diabetes, AIDS, pneumonia, accidents, and

automobile deaths(51). Another study found that **4 to 5% (up to 25%)** of the total hospital admissions are in part or in whole caused by ADRs, which often **(12 to 76%)** are preventable(52). It has been estimated that the cost of drug-related morbidity and mortality in the United States is one hundred thirty-six billion dollars per year(53).

Meanwhile, in Canada, approximately six-hundred million prescriptions are filled every year. It had been reported that more than **24%** of hospital admissions occur due to drug-related problems, where **70%** of those problems are believed to be preventable(54). Studies in the U.K revealed that 6.7% of hospital admissions are due to ADRs(55), and **15%** of patients suffer ADRs during their admission(56), which up to **50%** of them could be avoided(57).

Pharmacists are an important asset in the health care system; they are well educated, experts with medicines, well-positioned, and the most accessible members of healthcare providers(58). Unfortunately, pharmacists are still not exploited with their full potentials in the healthcare system.

Many studies had shown that pharmacists play an important role in the process of managing medication outcomes by effectively identifying and preventing actual or potential drug-related problems and that other healthcare providers acknowledge and act on the suggestions of pharmacists to handle the DRPs (acceptance rate of 41–96%)(59, 60).

A randomized control study done on outpatients showed that patient groups with pharmacists providing medication reviews and consultations to physicians reported fewer ADRs and a lesser amount of inappropriate prescribing(61). Results from a prospective randomized control study presented the benefits of pharmacist interventions on compliance with a rate of **92.1%** for the intervention group versus **23.7%** for the control group(62). Pharmacists help with achieving optimal drug therapy outcomes which result in lower drug therapy risks especially with NTI drugs, such achievements were seen in a comparative study on hospitalized patients on warfarin, the pharmacist-led anticoagulation services group showed improved anticoagulation of patients, reduced warfarin complications, a significant reduction in the length of hospitalization, an INR in the relevant medical range for a more

significant number of days and reported fewer medication interactions with warfarin and potentially a reduction in the allover cost (63).

All the above-mentioned positive contributions resulted from a proactive practice approach on behalf of pharmacists rather than a reactive one(64). The invention of pharmaceutical care is partially a response to the failures of the healthcare system when it comes to controlling the risks of drug therapy(65), but more importantly, pharmaceutical care is a concept on how pharmacists and patients should integrate their work and efforts to achieve desired outcomes important to patients and healthcare providers(52), and that it helps pharmacists to navigate their clinical practice in cooperation with patients and other healthcare providers (7, 66, 67).

2.1.3 The practice of Pharmaceutical care

Pharmaceutical care consists of three primary components; each one of them serves a slightly different purpose (40): The philosophy of the practice, the patient care process, and the practice management system.

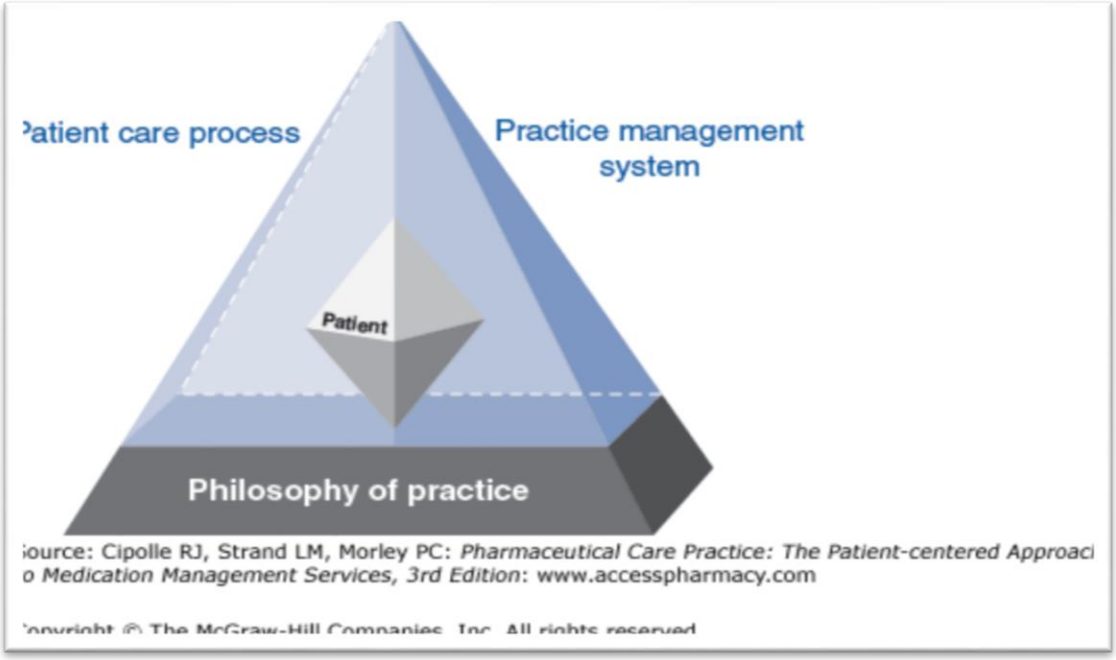


Figure 2.1 Pharmaceutical care paradigm

2.1.3.1 The philosophy of the practice

The pharmaceutical care philosophy comprises of four elements;1) a description of the social need for the practice, 2) a clear statement of individual responsibilities to meet this social need, 3) the expectation of being patient-centered, and 4) the requirement to function within the caring paradigm (68).

Any philosophy of practice acts as the base for the practice, where other components rely on it for moral guidance, that is because it is stable, and evolves over a long period of time. At its most surface level, the philosophy of pharmaceutical care highlights the "social" need of reducing morbidities and mortality related to drugs, while underlining that this social need is only achieved when individual practitioner's responsibilities are fulfilled on a patient-specific basis. It explains the way these responsibilities should be done; by centering all the efforts and activities towards the patient, using a caring model. All four elements work together to propose appropriate behaviors while practicing pharmaceutical care (68).

2.1.3.1.1 Social need

A profession only exists to meet a unique social need, and to justifies its elite status in a society, a profession has to serve society in a meaningful way. Pharmaceutical care practitioner optimizes the use of medications and intends to minimize morbidities and mortalities related to drugs within society, which only can be done when practitioners are well prepared and actualize their responsibilities on a patient-centered foundation. To achieve the social need for pharmaceutical care, the practitioner is obligated to attend to patients' needs separately, and by making decisions solely in the benefit of the patients and responses taken by practitioners should be to meet patients' needs without any self-driven interests the practitioner or for financial profits (68).

2.1.3.1.2 The practitioner responsibilities

The basic responsibilities of a pharmaceutical care practitioners are to check and make sure that the patient's medicines are appropriate, effective, safe and taken as intended, by fulfilling their responsibilities, practitioners meet their social need of optimizing medication use and minimizing drug-related morbidities and mortalities in the society and subsequently reducing the direct and indirect cost of illness(68).

2.1.3.1.3 An expectation of being patient-centered

Using a patient-centered approach is very crucial for pharmaceutical care practitioners; the patient's interests must come first. The patient must be seen as an entirety; without leaving any aspect out, the patient's health needs, especially drug-related needs, which must be the practitioner's top priorities. Patients must be understood as humans with rights, experiences, preferences, and knowledge for practitioners to fulfill their responsibilities. Patients are supposed to be treated as partners in a patient-centered approach; patients are those who eventually experience the outcomes of the drug therapy, and for that, patients are considered as decision-makers. For practitioners of the patient-centered approach, all the patient's drug-related needs and concerns about drug therapy become responsibilities to be fulfilled. Patients are the `` Polites`` of the care process in the patient-centered approach(68).

2.1.3.1.4 Need to Function in the Caring Paradigm

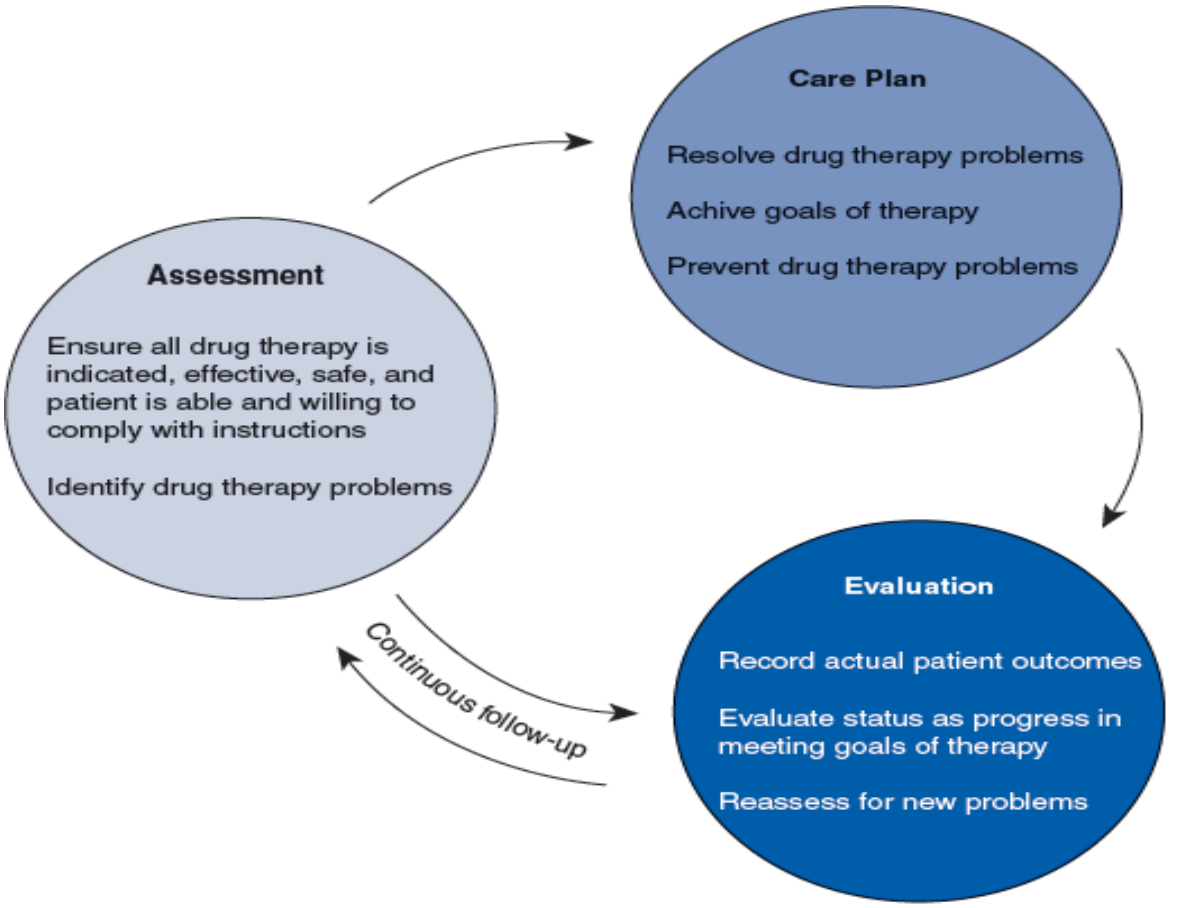
The pharmaceutical care practice is meant to serve a social need as mentioned before, which is decreasing drug-related morbidities and mortalities in the society, taking that in consideration helps to understated that "caring" within the philosophy of pharmaceutical care means doing everything thinkable to ease and eliminate any kind of suffering related to medicines. Practitioners of pharmaceutical care must spend all the time needed and do everything in hand in order to comprehend each individual medication experience to improve the next ones, for that to happen there should be a therapeutic relationship between the practitioner and the patient, one is based on trust, respect, commitment and accountability for what is done (68).

For a pharmaceutical care practitioner to act with care, it is a must to accomplish three objectives for the patient; 1) a thorough, comprehensive assessment of the patient's needs individually, 2) gather all available resources to meet those needs, and 3) professionally judging whether all the needs had been met, and to make certain no harm has been done (68).

These objectives manifest in the patient care process: assessment, developing a care plan, and the follow-up.

2.1.3.2 The patient care process

The patient care process presents pharmacists with a framework to provide patients with continuous individualized patient-centered care, which is essential in pharmaceutical care practice. The process incorporates practitioners' scientific knowledge, clinical knowledge, and interactions with the patients, resulting in a continuous dynamic instrument to grant patients with care. The patient care process includes three major steps "all highly depended upon each other": 1) patient assessment, 2) care plan development and implementation, and 3) follow-up evaluation(68).



Source: Cipolle RJ, Strand LM, Morley PC: *Pharmaceutical Care Practice: The Patient-centered Approach to Medication Management Services, 3rd Edition*: www.accesspharmacy.com

Figure 2.2: Patient care process

The foundation of the patient care process in pharmaceutical care is the *pharmacotherapy workup* (PTW); it is the cognitive process that happens in the minds

of pharmaceutical care practitioner while caring for patients. Pharmacotherapy workup is defined as *"a rational decision-making process used in pharmaceutical care practice to identify, resolve, and prevent drug therapy problems, establish goals of therapy, select interventions, and evaluate outcomes. It is a description of the thought processes, hypotheses, decisions, and patient problems that occur during practice"*(40).

2.1.3.2.1 Patient assessment

The main purpose of the assessment step is for the practitioner to determine whether the patient's drug-related needs are being met or not and to what extent. For that to happen, the pharmaceutical care practitioner has to gather, evaluate, look for, and make sense of the patient's information, medical condition, and drug therapy (68).

Assessment is not an onetime step; it is done multiple times and on various encounters with the patient, and it does not mean that it must always be done in a private room during an in-depth patient interview. The elements of the assessment process itself may differ according to the setting that is taking place. However, the general assessment process can be applied regardless of the different settings or scenarios (68, 69).

The assessment process has two components; 1) assessment of the patient; patient interview and history taking, and 2) assessment of drug therapy (using the pharmacotherapy workup); indicated, effective, safe, and most appropriate (adherence)(69).

2.1.3.2.1.1 Assessment of the patient

The pharmaceutical care practitioner must build a therapeutic relationship with the patient, based on trust, respect, and commitment, and he or she should ensure that the patient's goals are clearly defined. The before mentioned notes have to be done before interviewing the patient (68, 69)

Practitioners will have to gather relevant information about the patient(gender, age, weight, height, living situation, occupation, socioeconomic status, pregnancy and breast-feeding) in order to assess their, this can be done through several information sources (i.e., electronic medical records, patient interviews, physical examinations and

review of systems). A complete and thorough history taking is very important for a correct and proper patient assessment. Gathering patient information enables practitioners to understand the patient as an individual and to develop an individualized care plan (68, 69).

While interviewing the patients, practitioners need to determine four vital things: 1) the patient's reason for the encounter, 2) the patient's current medical condition and symptomology (if present), 3) the patient's medical history, and 3) the patient's medication history (68, 69).

It is very important to consider the patient's perspectives while determining the reason for the encounter. The patient's goals have to be the priority of the pharmaceutical care practitioner and have to be negotiated until both parties reach a sensible common ground. By including the patient's perspectives and goals into the assessment, a sense of trust and shared values is created, which helps with moving forward in the treatment plan. Practitioners must take notes during interviewing patients (68, 69).

Whilst assessing the symptoms of the patient, the practitioner must gather information about four main aspects;1) location/region, 2) what affects the symptoms (helps or worsens), 3) the gravity of symptoms, and 4) when do symptoms manifest. Practitioners are supposed to use appropriate interactive questions to elicit information on each of these aspects so they can have a better and clear understanding of the patient's concerns and symptoms (69).

A complete and comprehensive medical history of a patient should include: the present medical condition(s), resolved medical condition(s), and the patient's surgical history, in some cases, a physical examination is required.

The patient's medication history has to include; current medications, past medications, adverse reactions, allergies, immunizations, and patient's adherence, over the counter medications, herbal medications, dietary habits, and the patient's social history of smoking, alcohol drinking, and recreational drug use should also be included if relevant (69).

After eliciting all the information needed, and interviewing the patient, the practitioner is now able to determine the patient's current status in terms of symptoms and

presenting complaint, as well as the patient's main concerns, and can move forwards assessing the patient's medications.

2.1.3.2.1.2 Assessment of drug therapy:

Assessing the appropriateness of drug therapy is the cognitive center of care provided by a pharmaceutical care provider. Using the pharmacotherapy workup, the practitioner can assess the appropriateness of the patient's drug therapy by considering the four following questions(69): 1) is/are the medication(s) indicated? And is there any indication not being treated?, 2)Is/are the medication(s) the most effective for the patient?, 3) is/are the medication(s) the safest for the patient? and 4) does the patient have the ability and the willingness to adhere and take their drug therapy as intended? (69)

When assessing indication, there has to be a clear, logical reason for each of the patient's medications, unless there is, it is deemed unnecessary and has to be discontinued, practitioners should consider if there is any present medical condition that is not being treated with drug therapy and may require one. Each medication should be determined by the practitioner as the optimal therapy for the patient's condition based on the therapeutic guidelines, patient's comorbidities, and what are the set outcomes of the therapy(68, 69).

Drug therapy is considered effective if it is meeting its intended goals. To evaluate effectiveness, practitioners compare the patient's responses to the set of goals of the drug therapy that are agreed upon, and to determine if they have been achieved for each indication. The patient's signs and symptoms, the abnormal laboratory results related to the patient's medical condition, and a mixture of signs, symptoms, and laboratory results are used to assess the effectiveness of the drug therapy. Practitioners may increase the dosage, change the dosage form, and/or consider adding additional therapy if the initial therapy is not effective(69).

When assessing the safety of drug therapy, practitioners should consider two main things:1) adverse drug reaction, and 2) toxicities of the drug products. Adverse drug reactions manifest in two forms; it can be the undesirable or unintentional response to the known pharmacology of the drug, or it is an idiopathic effect experienced by the patient of direct relation to the drug product. Toxicity is a result of a too high dosage

regime for the patient. The practitioner must decide if the drug is responsible for creating the unintended effect that the patient is experiencing, if that is the case, another consideration arises regarding whether the unintended effect is associated with the drug dosage regime. Practitioners must review the patient's laboratory results and use tailored questions to the specific drug product to elicit the needed information from the patient because, in most cases, patients do not link symptoms to drugs. Drug therapy problems resulting from a drug high dosage regime can be resolved by reducing the patient's drug dosage regime; practitioners can advise the patient to take smaller doses or to take the does less frequently. If the drug therapy problem is deemed not dose-related, the patient is them switched to another drug product that is indicated to their medical condition. Drug interactions with either another drug product or with food should be assessed; practitioners must determine the severity of any case of drug-drug interaction if both are to be continued(69).

Adherence is defined as:*" the extent to which patients take medications as prescribed by their health care providers."*(70), when practitioners try to assess patients adherence, they need to understand that each patient has their personal medication experience, and may have a personal reason not to adhere to their medication, for that, it is the practitioner responsibility to investigate those reasons and resolve the nonadherence problem in order for the patient to have an indicated, effective, safe, and functioning drug therapy. Practitioners should use a nonjudgmental approach when asking the patients about how many times they forgot/ intentionally did not take their medications not to get a false answer, practitioners also need to assess the reasons that may be contributing to the nonadherence in order to develop a solution to overcome the problem. Adherence to each drug product should be assessed individually. Practitioners must pay attention to patient's ques, patients may have problems with understanding their drug therapy and how to manage it, but they may feel ashamed and pretend to understand it, also patients who miss their appointments are most likely to have an adherence problem(71-73). Interventions to improve adherence include patient education, family members'/caregiver's education, using bill boxes, simplify dosing scandals, reminder systems, and enhance the communications between the patient and the care provider(69).

After assessing the indication, effectiveness, safety, and adherence, practitioners can identify actual and potential drug therapy problems and move on to develop a care plan for the patient.

2.1.3.2.2 Care plan development

Care plans are designed for the sake of organizing all the work settled upon to achieve the patient's drug therapy goals. Achieving drug therapy goals call for resolving identified drug therapy problem(s) and preventing any new drug therapy problems from emerging, and by that, practitioners optimize patient's drug therapy experience.

Care plans help patients achieving their desired drug therapy goals; therefore, patients are asked to participate in the development of their care plans, and sometimes over healthcare providers are also included(68, 69).

Constructing a care plan involves three major steps: 1) establishing the goals of therapy, 2) setting an individualized intervention plan, and 3) schedule a follow up.

The most imperative step is establishing the goals of drug therapy. Parameters, values, and timeframes are to be set, and future outcomes are to be judged based on the established goals. Every decision or action is taken to achieve the set goals; therefore, goals must be clearly stated, understood by the patient and the practitioner, realistic, clinically achievable, and measurable with a timeframe.

Care plans are designed in order for practitioners to take action on behalf of the patients called "interventions." An intervention is done to 1) resolve identified drug therapy problems, 2) achieve the established goals of therapy, and 3) prevent the emergence of new drug therapy problems.

A patient's drug therapy goals would not be achieved until any identified drug therapy problem is addressed and resolved. A drug therapy problem is mostly to be resolved with initiating new drug therapy, discontinuing a drug therapy, increasing/ decreasing dosages, adding additional drug therapy, providing patient education, and referring the patient to another healthcare provider.

Practitioners design an individualized care plan to ensure the achievement of the established goals of therapy. Lifestyle modifications, exercise and diet, patient

education on the usage of medicines, implementation of technology, and patient instructions are all proved to help achieve the goals of therapy.

Practitioners, while assessing the patient, can identify risk factors that may contribute to developing a new drug therapy problem; therefore, actions are needed to be taken to prevent any new drug therapy problem. These actions may be integrated within the drug therapy regime, such as starting with the minimal effective dose to control side effects of a certain medication, taking medication with or without food, and warning patients about the possible side effects.

Some care plans may include alternatives to current drug therapy. Adding alternatives helps practitioners and other healthcare providers in understanding the reasons for choosing each medication.

The last part of a care plan development is scheduling a follow-up evaluation to determine what impact the interventions had on the patient's health. Positive and negative outcomes are to be judged based on the desired goals. Follow-ups need to be scheduled within a timeframe that allows for the impact to happen and results to be observable. If a patient has more than one care plan, follow-ups must be coordinated(68, 69).

2.1.3.2.3 Follow-up evaluation

Follow-ups aim to evaluate the actual clinical outcomes of the patient's drug therapy, judge the outcomes based on the set goals of therapy, assess the effectiveness, safety, and adherence of the drug therapy, and to state the present medical status of the patient.

Follow-up evaluations are essential for the continuation of the pharmacotherapy; practitioners gain new clinical knowledge and experience and see the outcomes of the drug therapy manifest.

During every follow-up evaluation, practitioners must assess the effectiveness, safety, and patient adherence, as well as assess the patient for any emerging drug therapy problem.

Patients' signs and symptoms, set parameters, and laboratory results are used to evaluate the pharmacotherapy workup elements, a positive result or improvement of symptoms or the lack of indicates if the drug therapy is effective or not, and helps with

assessing patients' adherence. Practitioners must assess any new undesirable effects caused by drug therapy to ensure safety and make a clinical judgment regarding the outcome status of each medical condition being treated with the drug therapy, and this helps with developing an individualized care plan suited to the patients' needs, desires, and medical conditions(68, 69).

Patient assessment is imperative during follow-ups; practitioners must reassess patients and investigate if any new drug therapy problems develop; in that case, the patient care process will begin all over again.

2.1.3.2.4 Documentation

Documentation is imperative in any healthcare practice; practitioners must document each and every decision, action, consultation, and evaluation they make. Documentation helps the practitioner and other healthcare providers to understand what has been done when it has been done, who has done what, and the process of doing it, Practitioners are expected to document each step of the patient care process (69).

Documentation differs from a care plan; in that, a care plan is long, detailed, and comprehensive, whereas a documentation note is much shorter and concise. Patients have multiple healthcare providers; errors happen when there is a lack of communication and coordination between different healthcare providers; thus, patient's health and safety become at risk because of unintentional and avoidable errors when documentation is absent. Documentation facilitates communication between different healthcare providers, ensures patient safety and transparency of practice and accountability, prevents any treatment duplication, maintains compliance with the standers of practice, and makes it easier to vet for quality assurance.

Practitioners can document using different forms of documentation; it can be a short note or a more detailed letter. Structured documentation takes the form of "DAP, Data-Assessment-Plan" format or "SOAP, Subject-Object-Assessment-Plan" format(74). Unstructured documentation is used when practitioners deem DAP or SOAP format unnecessary.

Any kind of documentation must be done in a sensible, timely way, succinct, clear and complete, and professionally done.

2.1.3.3 The practice management system

Every practice needs to be managed to survive, maintain a profitable financial income, and function within the standards of practice. The pharmaceutical care management system must ensure that every practitioner is well prepared for the practice, create a supportive environment for practice, and hold a clear and defined message of the mission of the pharmaceutical care practice (68).

A successful management system must allocate all the resources needed to provide effective and efficient care to patients, create methods for quality assurance and evaluation of the practice, create ways to attract new patients, and have justified and realistic payment methods (68, 75).

2.1.4 Implementation of pharmaceutical care practice

Growing numbers of studies worldwide indicate the benefits of implementing pharmaceutical care in many different settings, favoring the expanded role of pharmacists beyond just dispensing medications. Patients' outcomes, safety, adherence, and quality of life all showed significant improvements with the implementation of the pharmaceutical care practice.

A study was conducted on the impact of providing pharmaceutical care to hypertensive patients in a chain pharmacy practice; patients were divided into two groups (one hundred eighty in the pharmaceutical care group "PCG" and one hundred ninety-six in the usual care group "UCG"), where pharmacists monitored and managed the antihypertensive drug therapies of the patients. Patients in the PCG reported a reduction in systolic blood pressure by 9.9 mm. Hg, while patients in the UCG reported a reduction of 2.8 mm. Hg (p-value < 0.05). According to self-reporting, patients in the PCG were more likely to take their medications as prescribed compared to patients in the UCG (p-value < 0.05). Patients in the PCG also reported higher adherence rates to the antihypertensive drug therapy (0.91 ± 0.15) in the first six months comparing to patients in the UCG (0.78 ± 0.30) ($p = 0.02$)(76). A randomized control study was conducted to assess the impact of implementing pharmaceutical care services for hypertensive patients in a rural community in Portugal. This study had fifty patients in both the control and the intervention group, both of which had a forty-one-patient turnout at the end of the study. Pharmacists provided monthly appointments for six

months, where they monitored patients' blood pressure, assessed patients' adherence to their antihypertensive drug therapy, assessed patients for drug therapy problems (prevented, detected, and resolved), and provided lifestyle modification education, in contrast, the control group received traditional care. After the six-month intervention period, the intervention group reported a decrease by 77% of the prevalence of uncontrolled blood pressure (p-value < 0.001) and the control group by 10.3% (p-value = 0.48), a reduction in systolic blood pressure from (152 ± 23 mm. Hg to 129 ±15 mm. Hg) in the intervention group and (148 ± 15 to 143 ± 20 mm. Hg) (p-value < 0.001). Pharmacists detected twenty-nine actual DRP and resolved 24 out of them, and prevented 40% of reported potential DRPs(77).

A study in China was conducted to assess the effectiveness of implementing pharmaceutical care practice in the intensive care unit. The study was conducted in the same center over two periods (pre-intervention and post-intervention), a clinical pharmacist made two hundred thirty-two interventions during a three month period; of which two hundred ate two (87.1%) were accepted by a physician or a nurse, out of the two hundred thirty-two interventions eighty-three (35.8%) were dosage adjustments. The incidence of medication errors per patient was reduced from (1.68 to 0.46) (p-value <0.001) when pharmaceutical care practice was implemented, with the most improvement in the reduction of incorrect dose or dosage intervals (0.87 to 0.17 with a p-value <0.001)(78).

The impact of implementing pharmaceutical care services for Type 2 Diabetes mellitus patients was assessed by a prospective and experimental conducted in Brazil; seventy-one patients were recruited from the training and health center at the University of Sao Paulo and divided into two groups; the control group and the pharmaceutical care service group. Patients were poorly educated, with an inconsistency in health care provides and coming from low-class families. Pharmacists provided pharmaceutical care services where they monitored patients, managed patients' drug therapy, assessed patients for drug-related problems, and provided education and individualized care plans to each patient, whereas patients in the control group received traditional care. The study was carried out over a period of twelve months; by the end of the study, the PCG reported a drop in fasting blood sugar level from (181.7 mg/dL ± 85.2) to (133.6 mg/dL ± 40.6) (p-value < 0.05), while the control group reported a small change in

fasting blood sugar level (186.8 mg/dL ± 79.9) to (166.1 mg/dL ± 61.3) (p-value > 0.05). PCG also reported a decrease in the level of hemoglobin A1c (8.9 ±1.4) to (7.9 ± 0.8) (p-value < 0.05), while the control group reported an increase in the level of hemoglobin A1c (8.6 ± 1.3) to (9.3 ± 1.6) (p-value > 0.05) there was a significant statistical difference between the differences reported by the two groups results (p-value < 0.005). PCG patients reported a higher adherence score at the end of the study than when it started (beginning "2.8/4", the end "3.9/4) (p-value < 0.05). Pharmacists identified one hundred forty-two DRPs within the PCG ; the most common DRP was "Noncompliance" and resolved eighty-nine of them(79).

A study in Chile was carried out in an attempt to provide education for dyslipidemia patients to improve their adherence to the drug therapy, encourage lifestyle modifications, and to achieve cholesterol goals in order to enhance their quality of life. Patients were first approached in outpatient pharmacies and explained to the objectives of the study, after agreeing to participate and making the inclusion criteria, patients were divided and randomly assigned into "control" group where patients received the traditional care and " pharmaceutical care intervention" group where patients received a thorough pharmaceutical care plan and follow-up meetings. The study was conducted over a period of sixteen weeks, at which patients in the control group were interviewed two times, whereas patients in the PCG were interviewed five times. Pharmacists' services in the PCG included monitoring and obtaining patients' total blood cholesterol and triglyceride levels, providing disease-related education to patients, risk factors explanation to patients, general patient education, consultations on their medications, and assessing patients drug therapy problems and resolving them. At the end of the study, the PCG reported a reduction in blood cholesterol levels when comparing initial and final levels by a mean of (27.0 ± 41.1 mg/dL) (p-value = 0.0266), while the control group reported a reduction by a mean of (1.4 ± 37.2 mg/dL) (p-value = 0.6624). The PCG reported a decrease in the triglyceride level by an average of (50.5 ± 80.3 mg/dL) (p-value = 0.0169), whilst the control group reported an increase of an average of (29.6 ± 118.5 mg/dL) (p-value = 0.1435). Pharmacists identified twenty-six drug-related problems in the intervention group, out of which twenty-four were actively resolved, while pharmacists identified twenty-six drug-related problems in the control group, out of which only five were resolved. In general, the implementation of pharmaceutical

care services helped to improve patients' quality of life and resulted in positive outcomes(80).

A study in Spain was conducted to evaluate the effectiveness of pharmacists' intervention in prescribing an acute-care hospital (Hospital de Barcelona) over a period of six months, and their economic and clinical impact as well as their impact of patients' adherence. Pharmacists' interventions included change in dose/route of administration, pharmacokinetics, surgical antibiotic prophylaxis therapy, duplication in therapy, alternative therapy, thromboembolic prophylaxis, dose adjustment of aminoglycosides and vancomycin, inappropriate duration, non-formulary prescription, frequency of drug therapy. A multidisciplinary team of pharmacists, a physician, and an economist analyzed pharmacists' interventions over a period of six months.
The study found that pharmacists made three thousand-three hundred-thirty-six intervention, which made cost savings of (129,058.31 euro). Pharmacists made the highest cost savings with their interventions with antibiotic and thromboembolic prophylaxis and pharmacokinetics.

Physicians' rate of acceptance to the interventions made by pharmacists was "88.8%".

Pharmacists' interventions resulted were effective and efficient and, in the case of thromboembolic prophylaxis, prevented fatal situations. Recommendations regarding dose adjustments with aminoglycosides and vancomycin were generally accepted (the rate of acceptance was 82.2%). Antibiotic recommendations were generally correct and accepted (the rate of acceptance was 87%). Physicians accepted seventy-one percent of pharmacists' recommendations regarding inappropriate duration of treatment(81).

A pilot study was conducted to assess the impact of pharmaceutical care services in an outpatient lung transplant clinic in Toronto, Canada. Pharmacists provided pharmaceutical care services for a half-day per week for six-months in the clinic. Pharmacists interviewed patients separately or in the presence of a physician or an advanced practice nurse and used the pharmacotherapy work-up to assess patients and detect drug therapy problems; besides that, pharmacists also provided other services; patient education, medication education, medication reconciliation, and care plan development. The same sample of patients was the control group from the preceding

period of pharmacist intervention. Pharmacists detected an identified fifty-five drug therapy problem in forty-three patients over fifty pharmacist-patient encounters with a detection rate of (1.05 ± 1.34 DRPs per visit), while the detection rate for the same group without the pharmaceutical care services provided was (0.51 ± 0.64 DRPs per visit) (p-value= 0.018). Pharmacists provided forty-three recommendations, out of which forty-two were accepted. The most drug therapy problem identified was "adverse drug reaction," followed by "indication without treatment" and "non-adherence." Pharmacists provided services to patients with a rate of (3.4 services per patient encounter), with the most services provided in "primary pharmaceutical care interventions," "patient teaching," and "optimizing adherence to drug therapy." Clinicians deemed more than half of pharmacists' recommendations as clinically significant and ten percent as very significant. Patients were surveyed to assess their satisfaction with their encounters with pharmacists; two-thirds of patients (71%) responded with "very satisfied" scoring five out of five on the survey. In conclusion, pharmacists had a positive impact on patients' health and improved clinical outcomes as well as patients' quality of life(82).

2.1.5 Barriers to pharmaceutical care

An enormous amount of data and results have emphasized the benefits of implementing pharmaceutical care in the daily practice of pharmacy on patients' clinical outcomes, cost savings, upskilling pharmacists' clinical skills, and the continuity of the pharmacy profession. However, pharmaceutical care implementation into pharmacy practice has been slow due to numerous barriers(83). Barriers differ from country to another, and from practice to another, barriers also can be resource-related, pharmacist-related, time-related, patient-related, etc.(84)

A cross-sectional study was carried out in Argentina, where pharmacists from different practice settings" community pharmacy, hospitals, and primary care services" were surveyed to identify the barriers of implementing pharmaceutical care services in Argentina, ninety completed questionnaires were obtained. Lack of time was considered a major barrier in 88% of the responses generally; by 66% in practices where there is only one pharmacist present, whereas the percentage dropped to 54% and 40% in practices where there are two and three pharmacists present respectively. Lack of specific training was reported as another major barrier by 56% of the

responses. Lack of communication skills with patients was reported as the third major barrier by 37% of the responses. It is worth mentioning that 90% of the reported barriers by pharmacists are considered as "internal barriers," which means that pharmacists are able to implement pharmaceutical care services if they are willing to make a change by themselves(85).

A study was conducted in Europe to identify the barriers of implementing pharmaceutical care services within the European practices. Eleven representatives were interviewed from eleven countries, where efforts for implementing pharmaceutical care were made. Lack of money (reimbursements) was reported as the most important perceived barrier in implementing pharmaceutical care services in European countries with the highest score of impact (4.3/5). The attitude of the pharmacy stockholders/owner was reported as a major barrier and scored (4.2/5). Lack of time was reported to be a barrier in the European implementation of pharmaceutical care scoring (3.8). The attitude of other healthcare providers towards implementing pharmaceutical care services was also mentioned by all the countries' representatives as a major barrier, although it was with a lower impact score (3.8/5). Lack of documentation skills on behalf of pharmacists was considered a barrier and scored (3.7/5). Lack of communication skills was also reported as a barrier (3.7/5). Lack of clinical education was reported in ten out of eleven countries with a score of (3.5/5)(86).

A study in the Islamic Republic of Iran was carried out to identify barriers to implementing pharmaceutical care in the country. A self-administered survey was developed from the literature for the study and distributed to pharmacists in the capital city of Tehran. The survey had five possible domains of barriers to implementation; resources, attitude and vision, education and training, skills, and regulatory and environment, the survey used a five-Likert scale to measure pharmacists' opinions. "Education and training" domain was viewed as the domain that has the most impact on the implementation of pharmaceutical care in Iran by 68% of the responders, within the domain;" Lack of clinical education toward pharmaceutical care" was reported to be a barrier by 78.8% of the responders, following by "Lack of education in public domain toward professional services of pharmacists" by 76.5% of the responders. "Lack of education toward social pharmacy" by 73.9% of the responders, and "Lack

of education toward communication" by 72% of the responders. "Skills" domain was viewed as the second domain with the most impact by 63% of the responders; "Lack of skills for pharmacotherapy assessment" was reported to be a barrier by 75.5% of the responders, "Lack of managerial skills," " Lack of communication skills of pharmacists," and "Lack of documentation skills of pharmacists" were reported to be barriers by 71.1%, 70.6%, and 66.4% respectively. "Regulatory and environment" was viewed by 53% of the responders to be the third domain to impact the implementation of pharmaceutical care in Iran; "Legal barriers" was reported to be a barrier by 82.6% of the responders, "Inappropriate system for assessment and encourage pharmacies toward pharmaceutical care," "National health care structure in general," "Lack of clinical practice guideline," "Inertia of pharmacists as a group," and "Customers' hesitance to speak about private issues" were reported to be barriers by 81.3%, 76.2%, 69.7%, and 68.7% respectively. "Attitude and Vision" was viewed by 52% of the responders to be the fourth domain to impact the implementation of pharmaceutical care; "Lack of appropriate vision for professional development" was reported as the barrier with impact in this domain by 83.5%. "Resources" was viewed by 51% of the responders to be the fifth domain with impact; "Lack of money (reimbursement)" was reported by 81.7% as a barrier in this domain(87).

A study in New Zealand was conducted to identify and assess the perceived barriers of implementing pharmaceutical care in practice. A questionnaire was distributed on a randomly selected four hundred ninety pharmacists; the response rate was 76.9%. The questionnaire was divided into four set domains with different statements within; "Attitudinal factors," "Skill-set factors," "Resource-related," and "System-related factors." Over sixty percent of the surveyed pharmacists had a correct comprehension of the pharmaceutical care process, while twenty-two percent failed to agree with the correct statement regarding the pharmaceutical care process. In the domain of "Attitudinal factors"; "Pharmacists' level of understanding of pharmaceutical care" was reported a barrier by 42.7% of the responders, while "Lack of confidence" was reported by as a barrier by 41.7% followed by "Lack of motivation" by 35.9%. In "Skill-set factors" domain; "Lack of therapeutics knowledge" was reported as the major barrier by 56% of the responders, "Lack of clinical problem-solving skills" was reported by 54.5% followed by "Lack of documentation (processes/software)" and

"Lack of drug information resources (processes/access)" by 49.6% and 44.6% respectively. In "Resource-related factors" domain; "Insufficient time" was reported to be the major barrier in the domain by 87% of the responders, "Insufficient finances" was reported by 59.7%, while "Appropriate physical space," "Appropriate management systems (e.g., workflow)," and "Motivated personnel (e.g., pharmacists, technicians)" were reported by 54.4%, 51.3%, and 49.6% respectively. Finally, in "System-related factors" domain; "Lack of reimbursement system" was reported as the major barrier by 81.9% of the responders, "Lack of patient demand" was reported by 64.1%, while "Lack of access to patient medical records," "Lack of data on the value of pharmaceutical care", and "Doctor/nurse resistance" were reported by 61.3%, 52.4%, and 39.3% respectively(88).

2.2 Patient-Centered Care:

Patient-centered care is defined by the Institute of Medicine as" *Health care that establishes a partnership among practitioners, patients, and their families (when appropriate) to ensure that decisions respect patients' wants, needs, and preferences and that patients have the education and support they need to make decisions and participate in their own care."*(89)

The patient-centered care approach views the patient as an active part of the care process, a part that participates in any decision-making processes, the engine which drives the whole process (90, 91). Multiple studies had reported significant patient-positive clinical outcomes when a patient-centered care approach is applied, as well as the reduction in under/overuse of medical services (92), a decrease in malpractice complains (93), and an increase in both the patients' and healthcare providers' level of satisfaction (94, 95).

Delivering patient-centered care does not mean handing over the whole decision-making process to the patient (96), it means working on finding common ground with patients and trying to understand them as a whole person and respecting their values, personal beliefs, and preferences (97). The definition of patient-centered care emphasizes on engaging the patient when arriving at the point of making an important decision; where there is more than one opinion to consider with different everlasting

implications, some decisions must be taken in which patients' preferences play no role; where is only one clear path to take (98).

The Picker commonwealth program for patient-centered care, famously known as The Picker Institute, shed light on patient-centered care in the early years of the nineties of the last century with the results of their research. The results accented the need to respect the patient's preferences and personal values, the imperative need of clear and free communication between the healthcare provider and the patient ` sometimes including family members or caregivers`, managing care, and the need of respecting the patients mental and physiological wellbeing (99). The Picker institute asserted the need for healthcare providers and the healthcare system to refocus efforts from illnesses and medical conditions towards the patients and their families (100).

The patient-centered care approach has seven main elements; respect of patients' needs and preferences, respect of patients' personal beliefs, accessibility of information, education and shared knowledge, the involvement of family and caregivers, a partnership between all parties, and continuity of care (101).

Shaller. D summarized seven factors contributing to patient-centered care in practice; leadership, systematic measurement and feedback, patient/family involvement, a clear vision that is echoed throughout the practice, creating a supportive environment for caregivers, creating a high-quality environment, and using supportive technologies (102).

Patients with hypertension were reported to have higher levels of adherence to their drug therapy when receiving patient-centered care (103). A study assessed the results of providing patient-centered care to patients over a one-year period reported a reduction in health care utilization; a reduction in the frequency of hospitalization (p-value = 0.0033), a reduction in the number of visits the patients made to specialty care clinics (p-value = 0.02), and a reduction in the number of investigative pathology tests (p-value = 0.0027), as well as a reduction in patients' annual medical and specialty care clinic visits costs (p-value = 0.0002), (p-value = 0.0005) respectively (104).

2.2.1 Patient-centered care in pharmaceutical care

The pharmaceutical care practice embodies the patient-centered care approach, with having the patient's needs, values, and personal preferences at the center of the care

process while ensuring the importance of the therapeutic relationship between the patient and the health provider. Pharmaceutical care provides a specific structured manner of practice, where practitioners are aware of what must be done for each patient at the various parts of the patient care process.

Practitioners have to view the patient as a person with personal experiences not only as an object in the healthcare process, therefore in order to provide patient-centered care; practitioners must understand the patients' understanding of the concept of illness, medication experience in practice, and medication experience to optimize therapeutic outcomes.

2.2.2 Understanding the patients' concept of illness

Practitioners need to understand the way patients understand the concept of health to improve the usage of medications. Patients' attitudes can be negative or positive. On the one hand, patients with a positive attitude tend to link health to the "ideal state" represented by the World Health Organization definition of health" Health is a state of complete physical, mental, and social wellbeing and not merely the absence of disease and infirmity"(105), patients will be held to this definition until one of its components is compromised. Patients would often use functional status and ability to carry on with their daily lives to represent their health status when asked. This is extremely helpful for practitioners to decide the way they want to interview and assess the patient. On the other hand, patients with a negative attitude tend to link health with the absence of diseases, symptoms, and pain. Practitioners must know that patients with a negative attitude would often seek healthcare to cure their symptoms, not the underlying medical problem; this is extremely important to understand when assessing and interviewing patients.

Understanding patients' concept of illness is essential for developing the therapeutic relationship between the practitioner and the patient, how to develop the care plan, the kind of interventions that can be taken, and the patients' goal of therapy. Practitioners can elicit information about the patient's concept of illness and wellness, their motivations when seeking healthcare, what is seen as a healthy state in their perception.

The relationship between the patient's disease experience and behavior has four aspects which are; the patients'; "ideas about their illness, feelings, expectations, and the effects of illness on their functionality," as reported by Brown, Weston, and Steward(106). Exploring these aspects helps practitioners to understand the patient's medication experience and their identified drug therapy problems.

Practitioners can identify the type of patients using a tool developed by PCNE; this tool identifies patients according to their covet for information and perceived self-efficacy, either of which can be high or low. Four different types of patients arose out of this tool; 1) Eager listeners: those patients have low self-efficacy levels with high covet for information, 2) Contents: those patients have high self-efficacy levels with high covet for information, 3) Cash and Carriers: those patients have high self-efficacy levels with low covet for information, and 4) Followers: those patients have low self-efficacy levels with low covet for information (107).

2.2.3 The patient's medication experience

Medication experience is defined as "an individual's subjective experience of taking a medication in their daily life"(108). Medication experience includes multiple aspects; the patients' past experiences, their feelings, their expectations, and their apprehensions towards medications. Understanding the patient's medication experiences is imperative for practitioners to comprehend the patient's medication-taking attuited and therefore providing patient-centered care.

Four different themes of patient's medication experience were identified by the literature (108): the meaningful encounter with a new medication, exerting control, the constant nature of the chronic medication, and bodily effects.

Practitioners can use specific questions to bare the patient's medication experience. Practitioners should navigate those questions in a way that allows them to elicit information about:1) the patient's past experiences with a specific medication used to treat a specific condition;" tell me about your previous experience with this drug for this condition," 2) the patient's concerns about taking the medication; " what are your concerns about taking this drug for your condition?", 3) the patient's feelings about their medication and medical condition; " how do you feel about your condition/medication?", 4) the efficacy of the medication in the patient's opinion; "

are the medication working for you? Are you noticing positive changes in your symptoms?" 5) the patient's expectations; "what are your expectations form this medication?", 6) does the patient has any objections to taking their medications; " what are your objections to taking your medications?", and 7) the patient's thoughts and about taking their medication;" what is it like for you to take your medication?"(109)

2.2.3.1 Using the patient's medication experience to optimize therapeutic outcomes

Pharmaceutical care providers must use the patient's medication experience to their own advantage. Incorporating patient's experiences, needs, wants, and preferences create a feeling of a patient's "ownership" in the care process, which, in turn, results in positive outcomes (110-112). Good patient-provider communication is proved to result in an increase in patient's adherence to their drug therapy (113).

2.2.4 Practitioner-Patient relationship

The practitioner-patient relationship is called "the therapeutic relationship" and defined as*" partnership or alliance between the practitioner and the patient formed for the purpose of optimizing the patient's medication experience*"(40). The practitioner-patient relationship has six characteristics that it is based on; a collaboration between the practitioner and the patient (114-116), communication at several levels (115, 117, 118), empathy towards the patient (115, 119), mutual understanding(115, 116, 118, 120-122), mutual trust (123-126), and meaningful connection (120, 125, 127).

The practitioner-patient relationship goes throw five different phases throughout the care process, in which the therapeutic relationship is developed (116); phase one: this is the introductory phase, where the patient first meet the practitioner when the patient seeks therapeutic care, it is where the practitioner first attends to the patient needs and communicates interests to understand the patient as a person with past experiences and feelings (128, 129), phase two: this phase includes information gathering and patient assessment, problems are identified and goals are established (128, 129), phase three: care plan and timelines are developed to achieve the set goals (128, 129), phase four: this is where the implementation of the care plan takes place, both the practitioner and the patient meet their responsibilities, communicate clearly, and acknowledge feelings

in an honest way (128, 129), and phase five: this is the terminal phase, where the patient had already reached their therapy goals, it should be clear to both parties that the therapeutic relationship is different than a friendship or any other personal relationship humans develop in their lives (128-130).

2.3 Pharmacy in Jordan

2.3.1 Education

Jordan has nineteen different universities that offer pharmacy program "five public and fourteen private universities"(131). The bachelor's degree is a five-year program of one-hundred and fifty to one-hundred and sixty-five credited hours and one thousand-four-hundred and forty training hours of training at hospitals, pharmaceutical factories, or community pharmacies in order to qualify to the Jordan pharmacists association exam; which is mostly entirely product-oriented training(132). The pharmaceutical care education was first introduced in Jordan twenty years ago with the establishment of the Doctor of Pharmacy program at Jordan University of Science and Technology, followed by Jordan University, then with the Master's program in clinical pharmacy a few years later (132). The PharmD is a six-year program with two-hundred and sixteen credited hours, including twenty-nine weeks of clinical training (131). Pharmaceutical care-oriented subjects occupy twenty percent of the curricula in Jordanian universities (34, 133), which lacks specialized courses such as pediatric courses (134). None of the universities offer patient-oriented training for the bachelor's undergraduate students "general pharmacy" (34), whom they account for more than two-thirds of the enrolled students at all the universities (134). Gaps in the university curricula, lack of clinical practice educational environment, and the lack of mentorship during both undergraduate and postgraduate studies created a hiatus between the outputs of the universities and the real market needs (135), which has led to the clinical practice incompetence in freshly graduated pharmacists; lack in some necessary skills and knowledge, poor patient counseling, insufficiency with using medical literature to make informed medical decisions (136). A growing number of voices in the Jordanian pharmacy community emphasize the importance of shifting towards a more patient-oriented curriculum (133).

2.3.2 Pharmacy professional sectors in Jordan

2.3.2.1 Industrial pharmacy

Jordan has a remarkable pharmaceutical industry, both regionally and globally, which reaches more than sixty countries, including the United States and multiple European markets (137). Jordanian pharmaceutical companies are now venturing into the Biotechnology niche, such as Hikma Pharmaceuticals, which has more than sixteen factories around the globe (138). Jordan joined the World Trade Organization almost twenty years ago, a strategic move that helped in expanding the Pharmaceutical industry sector.

Pharmacists work in different departments; they can be found in the quality control department, research and development department, regulatory affairs department, medical department, and the business and marketing department as well.

2.3.2.2 Jordan Royal Medical Services (JRMS)

The Jordan Royal Medical services are the medical branch of the Arab army (the Jordanian army) that serves the armed forces and their families. The pharmacy sector of the *JRMS* was first established in the first year of the Jordanian independence in the year forty-eight of the last century at Markka hospital in the capital Amman (139).

The *JRMS* are working continuously on developing and enhancing its pharmaceutical sector by embracing a technical classification system for enrolled pharmacists, offering two residency programs of four years; clinical pharmacy and management and supply pharmacy, offering specialized courses; Master's in quality management, Master's in management and supply, and Master's in clinical pharmacy, offering the Board of Pharmacy after the finishing the beforementioned residency programs, and sending pharmacists to participate in international pharmacy conferences, and hosting others (139).

2.3.2.3 Clinical pharmacy

The role of the Jordanian pharmacist has expanded in the last twenty years in line with the expansion of the pharmacist role worldwide. Pharmacists in Jordan are taking on more roles and responsibilities beyond merely dispensing medications, and becoming more aware and driven towards clinical pharmacy and the concept of pharmaceutical

care(16). Clinical pharmacists in Jordan contribute to positive patient outcomes(16). King Hussain Cancer Center established the clinical pharmacy specialized service fifteen years ago, where clinical pharmacists attend clinical rounds with the rest of the medical team and provide patient-education, consultations, and document interventions. Nowadays, more than twenty-four hospitals in Jordan have an established form of specialized clinical pharmacy service (15). Studies show that physicians' have a (69.4%) acceptance rate of clinical pharmacists as part of the health care team, which indicates the weight of clinical pharmacists and the services they offer (140). There is a number of limitations which stand in the face of further expansion of the implementation of clinical pharmacy in Jordan such as; a lack of governmental policies that describe the role and responsibilities of a clinical pharmacist, the clinical pharmacy concept is relatively new and underdeveloped in Jordan, and the lack of communication channels with the rest of the health care team professions (141).

2.3.2.4 Community pharmacy

Nowadays, Jordan has more than twenty thousand registered pharmacists (pharmacists and PharmD) with a ratio of (17.3) pharmacists per (10.000) papulation(142), most of whom work in the community pharmacy sector (either independent pharmacies or chain pharmacies), which makes it the largest sector of the pharmacy profession in Jordan(143). The community pharmacy sector in Jordan is still developing mush like other sectors in the East Mediterranean region.

Community pharmacists provide a range of services to the public, such as; prescription and nonprescription medications, self-care products, cosmetics, and medical widgets. Community pharmacists are easily accessible with more than three thousand pharmacies scattered in the relatively small kingdom, patients "citizens and refugees alike" almost always seek medical advice from their community pharmacist as a first step before seeking medical care from their physicians(144). A study was carried out to explore the attitudes of community pharmacists concerning the issues related to community pharmacy services in Jordan. Results showed that "diagnosis" was the number one issue discussed with the patient (70.6%), followed by drug therapy regimes (13.4%), general health (11.5%), asking the pharmacist to recommend

physicians and discussing their opinions (2.7%), and inquiry about reproductive health (1.7%)(145).

Job satisfaction and job-related stress often affect the level and quality of services provided in any occupation(146, 147), for this reason, a study was carried out to determine the level of job satisfaction and job-related stress among pharmacists in the capital Amman. Community pharmacists were found to be less satisfied with their practice in comparison to hospital pharmacists (p-value<0.05). Demographics were found to correlate with pharmacists' job satisfaction levels, where pharmacists' marital status and year of registration having statistical significances (p-value=0.023) (p-value=0.048), respectively. Pharmacists who are single or earlier registered were found to be more satisfied with their job than married and recently registered. More pharmacists working in chain pharmacies answered with "defiantly" when asked if they will choose pharmacy as their profession again comparing to pharmacists working in independent pharmacies (45.0%), (31.4%) respectively. The number of prescriptions dispensed by the pharmacist was reported to affect their job satisfaction levels (p-value<0.05), with pharmacists dispensing more than twenty prescriptions reporting higher levels than those dispensing less than ten prescriptions a day (p-value<0.05). Year of registration was reported to have a significant statistical effect on patients' care responsibility as stressful job conditions (p-value<0.05). Pharmacists working in small chain pharmacies reported the lowest degree of stress toward patient care responsibility compared to pharmacists working in independent and big chain pharmacies (p-value<0.05). Employee pharmacists reported higher levels of stress regarding; work conflicts (9.40 ± 0.50) (p-value<0.01), workload (17.10 ± 0.42) (p-value<0.05), and professional uncertainty (7.05 ± 0.21) (p-value<0.01) when compared with their pharmacy-owner counterparts. Newly registered pharmacists reported the highest levels of stress regarding holding the responsibility of patient care (p-value<0.01)(148).

A study was carried out to assess the awareness, attitude, knowledge, and use of evidence-based medicine (EBM) among pharmacists in Jordan. The study reported that the majority of pharmacists (92.5%) views practicing EBM improves patient care, EBM is viewed as an excellent educational tool (90.90%), a large number of pharmacists (89.3%) think the EBM improves quick access to knowledge, EBM is

viewed as a tool to unify the quality and practice in the health care by (86.9%) of the pharmacists, while only (19.7%) found it difficult to base their practice on EBM, and (20.7%) think that EBM has a limited value in the pharmacy practice, and about a third (33.6%) believes that EBM is not applicable in their practice. The study's result reported that less than half of the pharmacists half the adequate knowledge to explain basic EBM terms, and that only a handful of pharmacists possess adequate knowledge in EBM concepts. The study also reported that almost half of the surveyed pharmacists (49.2%) lack the adequate EBM knowledge score. A negative correlation between EBM knowledge score and pharmacist's age and years of experience was reported (p-value=0.023) (p-value=0.04), respectively. Regarding pharmacists' source of information when caring for patients (80%) of the surveyed pharmacists rely on their judgment, (72%) rely on information provided to them by the medical representatives, and only merely half of them (54.5%) rely on textbooks. Pharmacists with PharmD degrees scored the highest EBM awareness levels, among other degrees (p-value<0.0005)(149).

The community pharmacy sector faces a number of problems in Jordan that is preventing it from further development; these problems can be financial problems; low salaries, educational problems; the pharmacy curricula in universities are not up to date with the market needs, administrative problems; a considerable number of pharmacies are owned by non-pharmacists, which is steering the practice to be business-centered rather than patient-centered, and some pharmacy owners employ pharmacy-technicians in lieu of pharmacists (141).

2.3.3 Pharmaceutical care practice in Jordan

Pharmaceutical care in Jordan is mainly provided by the ministry of health hospitals, the JRMS hospitals, and a few community pharmacies across the country. Although the implementation of pharmaceutical care services is limited, the literature has reported the positive outcomes of these services when implemented.

2.3.3.1 Pharmaceutical care implementations in hospitals and outpatient clinics settings:

Blood pressure control: a randomized controlled trial of clinical pharmacy management of patients with type 2 diabetes in an outpatient diabetes clinic in Jordan

reported that the intervention group which received clinical care and follow-ups from clinical pharmacists throughout the study period had reduced systolic (p-value=0.035) and diastolic (p-value=0.026) in comparison with the control group which received the usual care, and the percentage of patients who reached the target blood pressure in the intervention group was much higher than the control group;80.5% and 46.8% respectively(150). Another randomized control study was conducted to evaluate the role of clinical pharmacist's intervention in controlling blood pressure in dialysis patients; patients in the intervention group received collaborative physician-clinical pharmacist care, whereas the control group received the usual care. The intervention group patients achieved the target blood pressure by a percentage of forty-six in comparison to a percentage of fourteen in the control group (p-value=0.02), the intervention group reported a weekly mean home reduction in systolic pressure of 10.9 ± 17.7 mmHg (p-value=0.004) while the control group reported a weekly mean home increase of 3.5 ± 18.4 mmHg (p-value=0.396)(151).

Glycemic control: a randomized, controlled trial of clinical pharmacy management of patients with type 2 diabetes in an outpatient diabetes clinic in Jordan reported that the intervention group which received clinical care and follow-ups from clinical pharmacists throughout the study period had reported a decrease in mean A1c of (0.8%), whereas the control group had reported an increase in mean A1c of (0.1%) when compared to the baseline (p-value=0.019). The intervention group had reported a higher percentage of patients achieving the recommended A1c level, "which is less than seven percent" than the control group; (23.4%) and (15.2%), respectively (p-value=0.031). The control group reported an increase in mean fasting blood glucose levels at the end of the six-months trial period when compared with the baseline values by (0.9 mmol/L), whereas the intervention group reported a decrease by (2.3 mmol/L) (p-value=0.014)(150). Another prospective, randomized controlled study carried out in an outpatient clinic in a teaching hospital was carried out to assess the impact of a clinical pharmacist intervention on glycemic control in patients with type 1 and 2 diabetes. Clinical pharmacists interviewed patients in the intervention group and elicited information from their medical history, medication history, adherence, and current medical conditions, and offered follow-ups, consultations, and patient-education throughout the period of the study. The intervention group reported a significant reduction in the mean A1c level in comparison to the baseline by a mean

of (1.00±1.58) (p-value<0.001) while the control group reported an insignificant increase by a mean of (0.23±1.27) (p-value=0.241) there was a statistical difference between the two groups (p-value=0.013). The intervention group reported a decrease in mean fasting blood glucose levels by (28.44±84.62 mg/dl) compared to baseline values (p-value<0.001) and in comparison with the control group (p-value<0.05)(152).

Dyslipidemia: a prospective, randomized control trial was conducted to assess the impact of services provided by clinical pharmacists to dyslipidemia patients for a period of six months. Clinical pharmacists followed the intervention group with their physicians, interviewed the patients, elicited information about; their medical history, medication history, adherence, complications, and lifestyle, provided patient-education, follow-up calls, consultations, and recommendations to physicians. Pharmacists made one-hundred sixty-five recommendations throughout the trial period with (90.3%) acceptance. At the end of the trial (94.5%) and (71.2%) reached the target LDL level in the intervention group and control group respectively with a (p-value<0.001) when comparing between the two groups. By the end of the trail (87.7%) and (73.1%) reached their target total cholesterol levels in the intervention group and control group, respectively, with (p-value=0.038) when compared(153). Another a randomized controlled trial of clinical pharmacy management of patients with type 2 diabetes in an outpatient diabetes clinic in Jordan reported that the intervention group which received clinical care and follow-ups from clinical pharmacists throughout the study period had reported a percentage of (54.5%) of patients achieving their target LDL-C, whereas the percentage of patients in the control group who achieved their target LDL-C was (30.4%) with a (p-value0.018) when the two groups are compared. The intervention group reported a mean reduction when compared with the baseline values in; total cholesterol level by (0.7mmol/L), triglycerides levels by (0.5mmol/L), and in the LDL-C level by (0.6mmol/L), whereas the control group reported; no change in LDL-C level, a mean increase in total cholesterol level by (0.1mmol/L), and a mean increase in triglycerides levels by (0.2mmol/L) with p-values of (0.04) for total cholesterol, (0.031) for LDL-C, and (0.17) for triglycerides levels(150).

Lung function in COPD patients: a prospective, randomized controlled trial was carried on in Jordan to evaluate the impact of pharmaceutical care intervention

provided by clinical COPD patients in an outpatient COPD clinic at a *JRMS* hospital. Pharmacists interviewed the patients in the intervention group and elicited information from them, and provided patient-structured education, symptoms management, and follow up throughout the six months period of the trial. At the end of the trial, the intervention group reported a significant increase in knowledge score compared to the control group (p-value<0.001), while it remained the same in the control group. Non-adherence to prescribed medication had significantly decreased in the intervention group (28.6%) at the end of the trial compared to the control group (48.4%) (p-value<0.05). Patients in the intervention group at the end of the trial rated their drug therapy as more effective when compared to patients in the control group (p-value<0.01). The intervention group at the end of the trial reported a significant decrease in the number of hospital admissions for acute exacerbation of COPD when compared to the control group (p-value<0.05)(154).

Chronic kidney diseases: a prospective, before-after designed study was carried out in collaboration with the nephology team at the nephology wards in a teaching hospital in Jordan to assess the impact of pharmaceutical care service for hospitalized chronic kidney disease (CKD). Pharmacists elicited information from the patients' medical records and interviewed all patients about their medication histories. Drug therapy problems were identified for each patient individually on a daily basis, as well as checking the appropriateness of the dosing regimen. Pharmacists provided patients a structured patient education, optimization and evaluation of treatment, patient-motivational interviews, and management of CKD complications. At the end of the study six-hundred and ninety treatment-related problems had been identified by the pharmacists, of the total number of DRPs (17%) was revolved, (5.5%) was improved, (37.4) was prevented, (3.3%) was worsen, and (36.8%) had no change, all the before mentioned percentages had a p-value <0.0001. The improvement in the DRPs identification, prevention, and resolution had been improved four folds with the implementation of pharmaceutical care, as well as a (67.9%) relative risk reduction of DRPs were reported. The rate of recommendation acceptance was high at eighty-seven percent(155).

Metabolic syndrome: a prospective, randomized controlled trial was conducted in family medicine outpatient clinics in Jordan. This trial was carried out to assess the

impact of pharmacist-physician collaborative practice in the management of patients with metabolic syndrome. Pharmacists interviewed all the patients before the randomization all elicited information about their medical condition, medications, and lifestyle. At each monthly visit to the clinic, patients met with the pharmacists before meeting with their physicians, where pharmacists provided medication-education, counseled the patients, offered instructions on self-monitoring, worked with the patients on their adherence, and distributed educational materials to patients on lifestyle changes and disease-education, whereas the control group was only provided by the usual care by only the physician. At the end of the trial (39.1%) of the intervention group shifted from a status of metabolic syndrome to no metabolic syndrome, while only (24.7%) of the control group did (p-value=0.032). The intervention group reported a reduction in mean triglyceride from (189.3±79.6mg/dL) to (158.4±77.3mg/dL), whereas the control group reported a reduction from (202.5±88.0mg/dL) to (188.5±89.0mg/dL) (p-value=0.029). The intervention group reported a decline in mean baseline systolic blood pressure from (134.7±16.2mmHg) to (122.6±20.1mmHg), while the control group reported a decline from (134.6±12.2mmHg) to (127.7±14.6mmHg) (p-value=0.018). The intervention group reported a decline in mean baseline diastolic blood pressure from (83.6±10.7mmHg) to (76.4±12.6mmHg), while the control group reported a decline from (83.6±7.9mmHg) to (78.7±8.1mmHg) (p-value=0.049)(156).

2.3.3.2 Pharmaceutical care implantations in the community pharmacy setting

A study was carried out to investigate the public's views and attitudes towards the current role of the community pharmacist. A questionnaire was developed for this study consisting of four segments; the public awareness of the concept of pharmaceutical care, the public interactions with pharmacists and their experiences in community pharmacies, the patient's needs, wants and expectations of the services provided to them by their pharmacists, and the respondents' demographics. A total of one thousand two hundred and fourteen respondents were surveyed, with the majority being females (66.9%). When questioned about having any previous knowledge about the concept of pharmaceutical care, more than half of the respondents were found ignorant about it (54.4%). When questioned about their preferred source to obtain health-related information (86.8%) were found to prefer their general practitioner,

meanwhile when questioned about their preferred source to obtain medication-related information (69.4%) were found to prefer their pharmacist. The respondents reported that the most important activity performed by pharmacists is: dispensing medications (46.2%) followed by patient counseling (34.6%), explaining healthcare issues (13.4%), monitoring blood pressure (5.6%), and other reasons (0.7%). A large number of respondents reported that they visited a pharmacy once a month (52.5%), with almost half of the respondents reporting always visiting the same pharmacy (48.6%). When asked about the most important reasons for selecting a pharmacy to visit each time, respondents answered with; trust (46.4%) followed by good interaction (25.4%), the pharmacy's location is near my residence (19.2%), and discounts offered by the pharmacy (9.0%). Regarding time spent with the pharmacists, a large number of respondents (84.8%) viewed it as convenient, and (60.1%) reported that they believe their privacy is maintained when visiting the pharmacy. The majority of the respondents (85.5%) believe that their pharmacists had a role in providing healthcare services, and two-thirds of them (66.4%) reported that they prefer a pharmacist who takes their needs, preferences, and opinions when making decisions. The study reported that almost half of the respondents (47.6%) needed a follow-up from their pharmacist during the medication usage period, with almost two-thirds of them (62.8%) perceiving the pharmacist as a well-qualified source for health-related information. When asked about whether their pharmacist applies the pharmaceutical care concept, almost two-thirds of the respondents believe that their pharmacists do (63.4%), and more than two-thirds were satisfied with the services provided to them (68.8%). Furthermore, the majority of the respondents (87.5%) reporting a wish to have improved pharmaceutical care services such as; follow-ups, patient records, and drug therapy-related problems screening (157).

A study was carried out in Jordan's two most populated cities, "Amman and Zarqa," to investigate the pharmacist's role in delivering pharmaceutical care to the patients in the community pharmacies. A questionnaire was developed and hand-delivered to community pharmacists working in the two cities, one hundred and eighty questionnaires were delivered with a response rate of (90.5%). The study reported that most of the prescription dispensing occurs under a pharmacist's supervision (98.1%). Oral patient counseling and written medication instructions were reported to be

delivered by (95.1% and 90.1%, respectively) of the pharmacists when dispensing medications. A large number of the pharmacists (87.7%) checks for the most economical therapeutic alternative. Pharmaceutical care standards performed by the pharmacists were reported as; maintaining a therapeutic relationship with the patients, assessing the patient's OTC habits to determine if an undetected problem is present, providing lifestyle change guidance, and asking questions. None of the pharmacists performed all of the twenty-eight pharmaceutical care standards at their practice, more than half of the pharmacists performed nineteen of the twenty-eight standards. Less than a quarter of the pharmacists (23.1%) developed a care plan for the patient when a drug therapy problem was identified. Poor documentation of OTC medications was also reported with only (24.2%) of the pharmacists. Less than a third of pharmacists (29.7%) took the time to make appointments with patients who want to discuss their therapy. Patients' data collection was reported to be poor, with only (31%) of pharmacists performing it. All the surveyed pharmacists were welling to implement pharmaceutical care in their practices. More than two-thirds of the pharmacists (70%) were optimistic about pharmaceutical care and viewed it as a tool of development and survival of the pharmacy profession in Jordan. Pharmacists were not favorable about prearranged appointments with patients (47.5%), neither towards the documentation of patient's OTC recommendations (58.3%). Pharmacists were found to favor consulting with another pharmacist over other health care providers and split on whether pharmacists should engage in health promotion actives or not (5).

A prospective, randomized controlled study was carried out to investigate the impact of a medication management review (MMR) service on treatment-related problems (TRPs) and certain clinical outcomes in outpatients at two community pharmacy settings in the capital Amman. Recruited patients were asked to visit only the study pharmacy from which they were recruited during the study period. The pharmacist enrolled in the study assessed the (MMR) in the control and intervention group in order to determine the frequency and type of (TRPs) and made recommendations only to the patients' physicians who are in the intervention group. The pharmacist collected patients' information using a verified pharmaceutical care tool(158), patients' medical history, medication history, vital signs, current medication conditions, blood pressure, triglyceride levels, family history, lifestyle, and diagnostic test results. Follow-ups and calls were done by the enrolled pharmacist. The number of therapy-related problems

that were identified by the pharmacists during the period of the study was eight hundred and fifty-nine, with an average of (5.37±3.01) TRPs per patient. The study reported that most TRPs identified were efficacy (~13%), inappropriate adherence (~16%), miscellaneous problems, and inappropriate knowledge (~12%), with (90.3%) of the identified TRPs classified as major problems and (9.3%) as moderate. The most common interventions made by the pharmacist were; the need for an additive drug, additional monitoring, patient education, and patient counseling on adherence. The acceptance rate for the pharmacist's recommendations was (92%). The study reported in regards of outcomes as follows; the intervention group had (43%) of TRPs resolved, while the control group had (0.05%) of TRPs resolved (p-vale<0.001), the intervention group had (26.2%) TRPs improved, while the control group had (1.5%) improved TRPs (p-value<0.001), the control group had (87.4%) of TRPs with no change, while the intervention group had only (19%) (p-value<0.001), and the intervention group had (5.7%) added drug as an outcome, while the control group had (0.0%) (p-value<0.001). The intervention group had received a benefit forty-times more than the control group in regard to identifying and resolving TRPs(159).

A prospective, randomized controlled trial was conducted at community pharmacies in the capital city of Amman to study the impact of the Medication Management Review (MMR) service on the number of treatment-related problems (TRPs), patient satisfaction, and factors affecting patient satisfaction. Patients were randomized into the intervention and control group. Recruited patients were asked to visit only the study pharmacy from which they were recruited during the study period. The pharmacist collected patients' information using a verified pharmaceutical care tool(158), patients' medical history, medication history, vital signs, current medication conditions, blood pressure, triglyceride levels, family history, lifestyle, and diagnostic test results. Patients in both groups were followed up at three months after the baseline assessment. Therapy-related problems which could be resolved using patient education and counseling were delivered directly to the patient by the pharmacist without the need to contact the patient's physician. Patients had a mean number of medical conditions (3.56±1.15) per patient, a mean number of medications of (4.73±1.79) per patient, and a total number of TRPs of eight hundred fifty-nine, with a mean number of (5.37±3.01) TRPs per patient. Adherence related problems were the

most common with (~16%) of the total TRPs. The study reported that (13%) of the identified TRPs were caused by the need for an additive therapy, (12%) poor knowledge, and (12%) the need for more monitoring. Regarding the outcomes, the intervention group reported a (43%) of the TRPs resolved compared to the control with only (0.05%). The intervention group reported a (26.2%) improvement in TRPs compared with (1.5%) in the control group. The intervention group reported a much lower TRPs at the follow-up compared to the control group (1.06±1.30) (4.53±3.43), respectively, (p-vale<0.001). Patients were highly satisfied with the MMR service. Patients were satisfied with the pharmacist's recommendation about their medical condition (70%), providing nonpharmacological information (80%), medication-education (77%), education about the right way to take their medication (80%), and medication adherence-counseling (80%). Male patients were more satisfied with the services provided than female patients (p-value<0.001). Patients in both of the groups agreed that MMR should be paid for, with the significant statistical difference between the two groups; intervention (85.4%) and control (62.8%) (p-value<0.001). Regarding the way of payment, the majority of patients in the two groups believing that the services should be paid for by the government(160).

The community pharmacy practice in Jordan is still unfortunately nearly entirely product-centered practice with a hint of patient-centered practice(15) due to a number of reasons; a study was carried out in Jordan to assess the Jordanian pharmacist's understanding of the concept of pharmaceutical care, their extent of the practice of pharmaceutical care, and what are the barriers of implementing the concept of pharmaceutical care in their daily practices; more than three hundred community pharmacists were randomly handed the study's questionnaire that was set to assess the pharmacist's attitudes about pharmaceutical care intentions to provide specific pharmaceutical care, and activities and barriers to providing pharmaceutical care. The study reported that more than sixty percent of the pharmacists had a correct understanding of the fundamental concept of pharmaceutical care with only less than half of the same giving a correct, acceptable identification of pharmaceutical care, while more than seventy percent recognized the essential goal of pharmaceutical care and the roles of the pharmacist and the patients. Pharmacists were found to lack the proper skills of documentation. Pharmacists with less than ten years of experience and those with experience ranging from ten to twenty years were found to be more involved

in analyzing their patients' data to assess for adverse drug reaction than those with more than twenty years of experience ("37.9%", "42.5%", and "19.3%") had reported "always/usually" for assessing for ADRs (p-vale<0.05). The pharmaceutical care concept was supported by almost ninety-one percent of the surveyed pharmacists, with ninety-two of the pharmacists believing that pharmaceutical care is the right direction to be headed to with their practice. Pharmacists "ninety-four percent" reported that the provision of pharmaceutical care would benefit both the patient and the pharmacist. A large percentage of the surveyed pharmacists "seventy-nine percent" believe that upskilling clinical knowledge is essential in providing pharmaceutical care to patients. Pharmacists reported that the need of pharmaceutical care training is the number one barrier of implementing pharmaceutical care practice in Jordan (80%), followed by the lack of access to patients' medical records (77.6%), difficulty communicating with physicians (72.2%), the opposition from physicians (66.3%), the lack of support from colleges and pharmacists' association (67.3%), and the lack of data on the benefit of pharmaceutical care(64.3) were reported as the top six barriers(14). Another study was carried out to explore the needs, barriers, and motivations of pharmacists towards continuing education. The study found that the majority of pharmacists (63.5%) are in favor of the concept of continuous education, and more than eighty percent agree that continuous education would improve their knowledge and would have beneficial outcomes in their practice. The study also reported poor timing (51.9 %) and cost (51.2 %) as the two major barriers to continuous education (161).

2.3.4 Gaps in pharmaceutical care literature in Jordan

The literature has explored multiple aspects of the pharmaceutical care practice in Jordan until this date there has not been any studies that explored how pharmacists in Jordan check the appropriateness of drug therapy.

The pharmacist is expected to ensure the appropriateness of a patient's drug therapy by using the pharmacotherapy work-up, checking the indication, efficacy, safety, and adherence (65). When the appropriateness of drug therapy is checked for, the pharmacists can detect, resolve, and prevent actual or potential drug-related problems, which have positive clinical and economic outcomes for the patient, and improve their quality of life. This can be done by adapting the pharmaceutical care concept into the pharmacy practice in Jordan.

Worldwide only a couple of studies had been on how pharmacists check for drug therapy appropriateness. A study was carried out in Canada to illustrate how pharmacists gather patient information and apply the pharmacotherapy work-up when evaluating routine prescriptions in a community pharmacy setting. Audio recordings of pharmacist-patient interactions were made, alongside the pharmacists' think-aloud process. A mixed-methods thematic analysis was used to analyze the audio recordings. Records were made for new prescriptions and refills. The study reported that the majority of the pharmacist's time (~80%) was spent on technical activities; no difference was noticed in the clinical and technical times spend between new and refill prescriptions. None of the recorded pharmacists clearly used all the elements of the pharmacotherapy-workup. The information in the patients' profiles (allergies, clinical conditions, and interactions) was used to check for the clinical appropriateness of the prescription. The indication was checked for in only one recording, efficacy was checked for in three recordings, adherence was checked for in eleven recordings, and safety was checked for in all the twenty-one recordings using the information in the patient's profile. Pharmacists were found to spend only (27%) of the time the offer for consulting discussing clinical issues with patients, with new prescriptions having almost two times the clinical time that refill prescriptions had. The study reported four main themes describing pharmacists' activities; evaluating the prescription and counseling patients; missed opportunities, depersonalized assessments, reliance on routine, and nonspecific questions. The study concluded that pharmacists collect insufficient clinical information from the patient, miss patients' obvious cues, and rely on patients' profiles way too much. Pharmacists were also found to be biased against refill prescriptions when comparing the patients' information collected and the attention provided when dealing with new prescriptions (12).

A follow-up study was carried out to characterize how pharmacists employ the patient care process when evaluating the appropriateness of medication therapy in a simulated community pharmacy setting. The researchers developed a case scenario to be acted out in the community pharmacy setting to describe how pharmacists evaluate the appropriateness of drug therapy. The pharmacists were video recorded two times; the first recording was when the pharmacists were checking the prescription and the second during the pick-up (consultations) of the medications. Pharmacists were asked to verbalize their thoughts during the video recordings. A mix-methods thematic

analysis was used to analyze the recordings. A total of seventeen pharmacists participated in the study. Pharmacists were found to profoundly rely on the computer printout copy of the patient's profile to verify the patient's demographics and medication safety regarding allergies and drug interactions. It was noticed that pharmacists decided to dispense the medication without gathering the adequate amount of clinical information to check the appropriateness of drug therapy. Pharmacists either provided the simulated patient directions on how to take the medication or asked questions to assess the simulated patient's understanding during the "pick-up" interaction. None of the pharmacists check all the elements of the patient care process (assessment, care plan, and follow-up), although the majority completed most of them. Three elements of the pharmacotherapy work-up were completely checked for (indication, safety, manageability), while effectiveness was checked for by only almost the third of the pharmacists (35%). Two new main themes were identified in this study alongside the four identified in the previous study; the two new themes were; communication style, and response to patient cues. The study reported that pharmacists did not gather enough information to assess for the appropriateness of the drug therapy, check most but not all elements of the patient care process, heavily relied on the computer printout to assess parts of the drug therapy (drug-drug interaction), missed a number of the patients' cues and had skipped windows to improve communications with the patient(13).

2.4 The objectives of the study

We are expecting that this study would have significance in the following areas: patient outcomes and healthcare, address the shift in pharmacy practice, the integration of patient-centeredness to clinical reasoning, pharmacy education, and pharmacy practice research.

2.4.1 Impact on Patient Outcomes and the Healthcare System

checking medication appropriateness is a daily responsibility for pharmacists all over the world. Patient outcomes can be improved when pharmacists use those new and updated skills and techniques to detect and solve drug-related problems. Until now, even well-developed health care systems are struggling with the problem of unnoticeable drug-related problems. In Canada, a review of the causes of

hospitalizations found out that 24% were because of drug-related problems. Of these, 72% were of a preventable problem. In a second analysis, it has been estimated that hospitalization and emergency department visits due to drug-related problems in the senior population in Canada (i.e., Adults over 65 years old) cost the healthcare system over $ 35.7 million. There is a clear need to improve pharmacists' ability to detect drug-related problems. A study to describe how pharmacists' reason clinically should help address this problem.

2.4.2 Pharmacy Education:

The outcomes of this study will reflect the common practice in Jordan; therefore, we are expecting to have an impact on pharmacy education to train pharmacists and pharmacy students to adopt the "patient care process" effectively.

2.4.3 Pharmacy Practice Research

This study will also build upon previous research in pharmacy and improving up in the methodology by employing verbal reports that were collected consecutively without any interruption. We will also conduct a protocol analysis in order to describe pharmacists' cognitive thinking. For these reasons, we are proposing this study. We are aiming to analyze three types of data: consultations, think-aloud, and retrospective protocols to get a complete picture of the process

and pharmacists' clinical reasoning. The verbal reports in this study will be collected consecutively, one task at a time, and without interruptions. We are also proposing protocol analysis in order to able to describe pharmacists' cognitive thinking in depth.

2.4.4 Objectives

1- To describe how pharmacists check for prescriptions' appropriateness (i.e., Pharmacotherapy workup).

2- To characterize community pharmacists' clinical reasoning using "the patient care process."

and "the clinical reasoning cycle" as defined by the field of nursing

a. what stages of the patient care process do they follow

b. what cues or information pharmacists collect

c. how pharmacists decide if the patient's drug-related needs are being met (indication, effectiveness, safety, adherence)

d. what are mental operators' pharmacists employ when they collect and process information, they gathered to assess drug-related needs using a well-defined framework in nursing (i.e., clinical reasoning cycle).

3. METHODOLOGY

3.1 Study design

This observational, descriptive study used a mixed-method design(162). A simulated patient scenario was used for this study, where the simulated patient goes to the pharmacy to dispense his prescription. The data consist of two types of audio recordings (transferred to transcripts); the first type is a recording of the pharmacists' interaction with the simulated patient during the medication dispensing process. The second type is a retrospective recording of the researcher asked the pharmacists five questions on how they checked the appropriateness (indication, effectiveness, safety, manageability, and drug therapy problems) of the prescription they dispensed during the simulated patient scenario.

A questionnaire was used to describe the sample's knowledge, attitudes, and perceived barriers to the pharmaceutical care concept, and to collect the sample's demographics.

3.2 Sample

The study sample consists of the pharmacists working in a pharmacy group chain in one of Jordan's most populated cites. All the pharmacists had voluntarily agreed to take part in this study. The data was collected during the month of January of 2020.

3.3 Procedure

The chain pharmacy group head-office was contacted by the researcher, and they gave the approval to conduct the study in their pharmacies. The researcher visited the chain's branches after receiving a visiting schedule from the chain head-office. The researcher approached the pharmacists during their shifts and explained to them the process. The researcher was the simulated patient in all the interactions. The pharmacists were asked not to share the study information (the simulated case scenario) with their colleagues to maintain the data credibility. Informed consent was obtained from all the pharmacists.

3.4 Simulated case scenario

The simulated case scenario was created in a way that allows the pharmacists to collect relevant information from the patient easily, and check for the appropriateness of the

drug therapy using the pharmacotherapy workup. The prescription was for a chronic condition.

The case scenario was developed with the help of a clinical pharmacist and was run with four different pharmacists who were not included in the study population.

3.5 The questionnaire

The questionnaire was adapted from (Salah AbuRuz, Moatasem Al-Ghazawi, and Ann Snyder, 2012) (14) it was used to assess the pharmacists' understandings of pharmaceutical care and what perceived barriers are present. The questionnaire's items were further modified to serve the aims of this particular study by the researchers. The questionnaire had four different parts; 1) demographics to gather basic descriptive information about the study sample, 2) the pharmacists general attitudes towards the concept of pharmaceutical care, 3) the pharmacists' daily practice activities, and 4) the perceived barriers of pharmaceutical care.

3.6 Ethical approval

The ethical approval of this study was attained from the Institutional Review Board (IRB) of King Abdullah University Hospital and Jordan University of Science and Technology (JUST).

The researcher explained the nature of the study to the interviewees and guaranteed that their identities will remain anonymous throughout the study and will not be shared with their employer. The interviewees signed a written consent form after agreeing to take part in the study and before starting the simulated case scenario or answering the questionnaire.

The data collected for this study (audio recordings, transcripts, and questionnaire answers) is to remain secretive. The identities of the interviewees are to remain anonymous. The name and locations of the pharmacy chain are to remain anonymous.

3.7 Data collection

The simulated patient-pharmacist interaction was a normal prescription dispensing process. The pharmacist was presented with a written prescription for a chronic condition. The pharmacist was asked to gather the information they usually gather in

order to check for the appropriateness of any drug therapy they deal with in their practices. When the simulated patient scenario was over, the researcher asked the pharmacist five questions regarding the interaction during a retrospective recording.

The pharmacist was asked if there was any drug therapy problem in the prescription they had just dispensed, and if so what was it, how did they make sure that the drug therapy was indicated to the patient, how did they make sure that the drug therapy was effective to the patient, how did they make sure that the drug therapy was safe to the patient, and how did they make that the patient would be adherent to the drug therapy.

Inclusion criteria:

Employees with a degree of pharmacy (BSc. in pharmacy or PharmD) working in one of the chain's pharmacies.

Exclusion criteria:

Pharmacists working in the management department of the chain pharmacy and pharmacy technician working in the pharmacies.

3.8 Data analysis

Data was stored and organized using NVivo 11 Software(163). A quantitative and another qualitative analytical approach had been used in this study.

3.8.1 Quantitative analysis

All responses to the questionnaire were coded and entered into a Microsoft Excel spreadsheet and then analyzed using the SPSS version 23. Simple descriptive statistics were used to summarize demographic information and questionnaire responses. Simple counts and frequencies were obtained.

A quantitative codebook was adapted from the patient care process. Instances of the patient care process "throughout the patient-pharmacist interaction" were counted as "did not" happen "zero" and "one" if it "happened." An additional analysis was done to describe how pharmacists elicited information and asked the three prime questions. Also, the retrospective think-aloud transcripts were quantitatively analyzed to assess the incidences of PTW (indication, effectiveness, safety, manageability, and drug-related problems) and what kind of information had been used by the pharmacists.

3.8.2 Qualitative analysis

A generic qualitative approach was used to analyze all transcripts of the retrospective interviews (164, 165). The transcripts of the retrospective interviews were thoroughly reviewed and coded in order to describe how pharmacists check for the appropriateness of drug therapy.

The forward-backward translation method was used to ensure the authenticity of the transcripts used in the study after translating it from its original language "Arabic" to "English."

3.9 Validation

3.9.1 The questionnaire

The questionnaire was adopted from a previously published article in the literature (Salah AbuRuz et al., 2012), in which is served the same purpose that it was used for in this study. The questionnaire was also face-validated by six different pharmacists who were not included in the study population.

3.9.2 The simulated case scenario

The simulated case scenario was developed by two pharmacists with clinical expertise. The simulated case aimed to investigate how community pharmacists assess the appropriateness of a refill prescription. The simulated case was reviewed by four experts in clinical pharmacy "including two academics" for content validity. The experts were asked to rate the components of the simulated case using a four-point ordinal scale: 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, and 4 = highly relevant. The average content validity index for the simulated case was 0.87 indicating an acceptable validity. Moreover, the simulated patient practiced the simulation with six different pharmacists who were not included in the study population to ensure consistency in simulation and familiarity with case scenario.

4. RESULTS

4.1 Quantitative Study Results

4.1.1 Participants' demographics

A total of twenty-seven pharmacists who work in a pharmacy chain were approached by the researcher, twenty-six pharmacists agreed to participate in the study, and one refused to partake in the study for private reasons. Of the interviewees, eight were males (30.8%), and eighteen were females (69.2%). The interviewees were young adults with an average age of (27.5 ± 3.33) years. The average number of years of experience was (4.6 ± 3.37) years. All the interviewees reported working full time. When asked about the busyness of their workplace, almost half of the pharmacists (42.3%) reported working in a "Somewhat busy" pharmacy. The average number of drug-related problems detected by the interviewees was (5.6 ± 4.38) drug-related problems a week. The most common type of drug-related problems detected by the interviewees was "Dose issue" reported by most of the pharmacists, followed by "Compliance" as the second most detected drug-related problem. Table 4.1 describes interviewees ' demographics in more detail.

Table 4.1 Participant pharmacists' demographics

Characteristics		N (%)
Gender	Male	8 (30.8%)
	Female	18 (69.2%)
Pharmacy Busyness	Slow with busy times	10 (38.5%)
	Somewhat busy	11 (42.3%)
	Busy	5 (19.2%)
Age (mean± STD)	27.5 ± 3.33	
Years of experience (mean± STD)	4.6 ± 3.37	
Average DRPs detected/week	5.6 ± 4.38	
Common DRPs detected	Unnecessary medication	1 (3.9%)
	Dose issue	23 (88.5%)
	Drug interactions	6 (23.1%)
	Adverse reaction	6 (23.1%)
	Compliance	17 (65.4%)

4.1.2 Pharmacists' general attitude to pharmaceutical care

The interviewees viewed pharmaceutical care as the right direction for the pharmacy profession to be headed, with (100%) answering "strongly agree" or "agree" to the sentence. All the interviewees fully supported the concept of pharmaceutical care and believed that the introduction of pharmaceutical care would benefit the pharmacy profession, with (100%) answering "strongly agree" or "agree" to both sentences. Almost all the interviewees believed that the provision of pharmaceutical care would benefit their patients, with (92.3%) answering "strongly agree" or "agree" to the sentence. The majority of the interviewees believed that upskilling of clinical knowledge is essential to providing pharmaceutical care, with (92.3%) of pharmacists answering "strongly agree" or "agree" and (7.7%) answering "neutral" to the sentence. Interestingly, more than half of the interviewees believed that other healthcare providers would not support the pharmacist's pharmaceutical care role, with (61.5%) of pharmacists answering "strongly agree" or "agree" to the sentence. More than half of the interviewees (57.7%) believed that it is practical to provide pharmaceutical care to patients in Jordan. The same previous percentage also believed that patients would accept care provided by a pharmacist. A large percentage of the interviewees (73.1%) did not think that a master's in clinical pharmacy or a degree of PharmD is necessary to provide pharmaceutical care. Less than half of the interviewees (42.3%) believed that pharmacists should obtain a certificate or accreditation for providing pharmaceutical care services, while (23.1%) agreed and (34.6%) were neutral. Table 4.2 describes pharmacists' general attitude to pharmaceutical care in more detail.

Table 4.2 Pharmacists' general attitude to pharmaceutical care

General attitude to pharmaceutical care		Strongly agree or Agree n (%)	Neutral n (%)	Strongly disagree or disagree n (%)	Mean (SD) (after reverse coding negative statements)
1	Pharmaceutical care is the right direction for the pharmacy profession to be headed	26 (100)	0	0	4.5±0.51
2	I do not think that it is practical to provide pharmaceutical care to patients in Jordan	3 (11.5)	8 (30.8)	15 (57.7)	2.3±0.97
3	If there was an extra payment for providing pharmaceutical care, the focus for the majority of community pharmacists would change	23 (88.5)	2 (7.7)	1 (3.8)	4.3±0.78
4	I think that my provision of pharmaceutical care would result in a significant benefit to patients	24 (92.3)	1 (3.8)	1 (3.8)	4.5±0.76
5	The introduction of pharmaceutical care will benefit the pharmacy profession.	26 (100)	0	0	4.6±0.5
6	Pharmaceutical care should be practiced only after obtaining an MSc in clinical pharmacy or a PharmD	3 (11.5)	4 (15.4)	19 (73.1)	2.0±1.11
7	I think there must be some sort of certification, approval, accreditation for providers of pharmaceutical care.	11 (42.3)	9 (34.6)	6 (23.1)	3.4±1.23
8	I fully support the concept of pharmaceutical care	26 (100)	0	0	4.6±0.5
9	It is the physician role to identify drug therapy problems and ensure that the patient's health outcomes are ultimately achieved since he or she prescribed drug therapy	4 (15.4)	5 (19.2)	17 (65.4)	2.1±1.13

10	Pharmaceutical care requires major upskilling of clinical knowledge	24 (92.3)	2 (7.7)	0	4.4±0.63
11	Physicians and other health professionals will not support a pharmaceutical care role for pharmacists	16 (61.5)	5 (19.2)	5 (19.2)	3.7±1.16
12	The future success of pharmacy will depend on the provision of professional services other than dispensing	25 (96.2)	1 (3.8)	0	4.5±0.71
13	Patients will not accept care provided by the pharmacist	0	8 (30.8)	15 (57.7)	2.5±0.95

4.1.3 Perceived barriers to pharmaceutical care practice

The majority of the interviewees (92.3%) viewed the need for pharmaceutical care training as a barrier to pharmaceutical care in their daily practice. Interestingly, almost two-thirds of the interviewees (65.4%) considered the lack of data on the benefits of pharmaceutical care as a barrier. A high proportion of the interviewees (84.6%) considered the lack of a private counseling area to be a barrier. Most of the interviewees considered the physicians' rejection of the pharmacist's role in pharmaceutical care (80.8%) and the lack of staff (76.9%) as barriers. Understanding of the concept of pharmaceutical care was viewed as a barrier by (69.2%) of the interviewees. Most of the interviewees (73.1%) considered the difficulty in communication with physicians a barrier. The interviewees divided on considering the lack of patient acceptance a barrier, half of the pharmacists considered it a barrier while almost the other half (46.9%) did not, and with (3.8%) being neutral. More than two-thirds of the interviewees (69.2%) considered the economic status of patients and the lack of support from employers and regulatory bodies as barriers. Table 4.3 describes the perceived barriers to pharmaceutical care practice in more detail.

Table 4.3 Perceived barriers to pharmaceutical care practice

Perceived barriers to pharmaceutical care practice		Strongly agree or Agree n (%)	Neutral n (%)	Strongly disagree or disagree n (%)	Mean (SD)
1	Level of understanding of pharmaceutical care.	18 (69.2)	5 (19.2)	3 (11.5)	3.8 ± 1.08
2	Lack of documentation skills.	19 (73.1)	4 (15.4)	3 (11.5)	3.8 ± 1.05
3	The need for pharmaceutical care training.	24 (92.3)	2 (7.7)	0	4.1± 0.52
4	Lack of private counselling area.	22 (84.6)	4 (15.4)	0	4.2±0.68
5	Lack of staff.	20 (76.9)	4 (15.4)	2 (7.7)	3.9±0.95
6	Lack of appropriate management systems(e.g. workflow).	18 (69.2)	4 (15.4)	4 (15.4)	3.8±1.02
7	Lack of access to patient medical records.	19 (73.1)	5 (19.2)	2 (7.7)	3.9±0.89
8	Lack of data on the benefits of pharmaceutical care.	17 (65.4)	2 (7.7)	7 (26.9)	3.5±1.10
9	Lack of support from stockholders/pharmacists' association /regulatory bodies.	18 (69.2)	5 (19.2)	3 (11.5)	4±1.04
10	Lack of patient acceptance.	13 (50.0)	1 (3.8)	12 (46.2)	3.1±1.16
11	Economic status of patients.	18 (69.2)	4 (15.4)	4 (15.4)	3.7±1.08
12	Waiting time for patients.	20 (76.9)	4 (15.4)	2 (7.7)	4.0±0.89
13	Physicians will be against it.	21 (80.8)	5 (19.2)	0	4.3±0.78

14	Difficulty communicating with physicians.	19 (73.1)	5 (19.2)	2 (7.7)	3.8±0.91

4.1.4 Patient care process

4.1.4.1 Assessment process

All pharmacists performed at least two steps of the assessment process throughout the patient-pharmacist interaction (Table 4.4). Three pharmacists performed all the steps of the assessment process. Twelve pharmacists met the patient, and only six pharmacists elicited demographic information. All of the twenty-six pharmacists elicited information about the patient's past and current medication history, while fifteen pharmacists elicited information about the patient's wants, needs, and concerns. Twenty-one pharmacists gathered clinical information about the patient's medical condition. Pharmacists used the three prime questions to elicit information about the patient's medical history, clinical information, medication history, and current medical conditions. Prime question one "PQ1" (indication) was touched upon in twenty-nine instances for the two medications, fourteen instances for the levothyroxine, and fifteen instances for the calcium supplement. Prime question two "PQ2" (directions) was the most touched upon of the prime questions; it was touched upon in fifty-one instances; all the pharmacists except for one addressed it for the levothyroxine, and all the twenty-six pharmacists addressed it for the calcium supplement. Prime question three "PQ3" (monitoring) was the least touched upon of the prime questions, twenty-three instances, thirteen instances for the levothyroxine, and ten instances for the calcium supplement.

4.1.4.1.1 Prime questions

4.1.4.1.1.1 Levothyroxine

Pharmacists addressed "PQ1" in fourteen instances during the patient-pharmacist interaction (Table 4.5). Four different ways were used to elicit information regarding the indication of the medication, out of the fourteen instances; pharmacists used an open-ended question in four instances (28.5%), in one instance a pharmacist used a close-ended question (7.1%), pharmacists used a leading question in five instances

(35.7%), and in four instances (28.5%) pharmacists did not use a question to elicit the information; however, they used the monologue to inform the patient.

Pharmacists addressed "PQ2" in twenty-five instances during the patient-pharmacist interaction (Table 4.5). Four different ways were used to elicit information regarding the directions of the medication, out of the twenty-five instances; pharmacists used an open-ended question in seven instances (28%), a pharmacist used a close-ended question in one instance (4%), pharmacists used a leading question in four instances (16%), and in thirteen instances (52%) pharmacists did not use a question to elicit the information; however, they used the monologue to inform the patient.

Pharmacists addressed "PQ3" in thirteen instances during the patient-pharmacist interaction (Table 4.5). Four different ways were used to elicit information regarding the monitoring of the medication, out of the thirteen instances; pharmacists used an open-ended question in four instances (30.7%), in four instances (30.7%) pharmacists used a close-ended question, pharmacists used a leading question in four instances (30.7%), and in one instance (7.6%) a pharmacist did not use a question to elicit the information; however, they used the monologue to inform the patient.

The interviewees used the three prime questions to assess drug therapy and detect drug therapy problems. Twenty pharmacists detected the drug-related problem for the thyroid drug during the patient-pharmacist interaction.

4.1.4.1.1.2 Calcium supplement

Pharmacists addressed "PQ1" in fifteen instances during the patient-pharmacist interaction (Table 4.5). Two different ways were used to elicit information regarding the indication of the supplement, out of the fifteen instances, pharmacists used an open-ended question in twelve instances (80%), while a leading question was used in the other three instances (20%).

Pharmacists addressed "PQ2" in twenty-six instances during the patient-pharmacist interaction (Table 4.5). Four different ways were used to elicit information regarding the directions of the supplement, out of the twenty-six instances; pharmacists used an open-ended question in eight instances (30.7%), pharmacists used a leading question

in twelve instances (46.1%), close-ended questions were used in five instances (19.2%), and in eleven instances (42.3%) pharmacists did not use a question to elicit the information; however, they used the monologue to inform the patient.

Pharmacists addressed "PQ3" in ten instances during the patient-pharmacist interaction (Table 4.5). Three different ways were used to elicit information regarding the monitoring of the supplement, out of the ten instances; pharmacists used an open-ended question in two instances (20%), close-ended questions were used in three instances (30%), and pharmacists used a leading question in five instances (50%).

The interviewees used the three prime questions to assess drug therapy and detect drug therapy problems. Only three pharmacists detected the drug-related problem for the calcium supplement during the patient-pharmacist interaction.

4.1.4.2 Care plan

None of the pharmacists performed the three elements of the care plan development throughout the patient-pharmacist interaction (Table 4.4). Twenty-two pharmacists discussed or mentioned the goals of therapy with the patient. All the twenty-six pharmacists determined an intervention with/to the patient to resolve the drug therapy problem. None of the twenty-six pharmacists planned for a follow-up with the patient.

4.1.4.3 Follow-up

The follow-up process was the least touched upon the process by the pharmacists of the whole patient care process (Table 4.4). Only four instances in which one of the elements of the follow-up process were addressed throughout the patient-pharmacist interaction. One pharmacist addressed changing the care plan and offered to provide continuous care to the patient. One pharmacist addressed the evaluation of the effectiveness, and another pharmacist addressed the evaluation of the safety of drug therapy.

Table 4.4 Patient care process steps

Assessment Elicit Info	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026
Meet Patient		X	X				X		X	X	X		X	X				X	X						X	X
Demographics		X	X				X	X						X						X						
Medication History	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Clinical Info	X	X	X	X	X	X		X	X	X			X	X		X		X	X	X	X	X	X	X	X	X
Patient Needs	X	X	X		X		X		X			X		X			X	X		X	X		X	X	X	
n/a																										
Care Plan	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026
Goals of therapy		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X
Determine interventions	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Plan a follow-up																										
n/a																										
Follow-up	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026
Evaluate effect				X																						
Evaluate safety																								X		
Change plan		X																								
Provide cont. care		X																								

Table 4.5 Prime questions

Levothyroxine																										
Prime questions	**001**	**002**	**003**	**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	**013**	**014**	**015**	**016**	**017**	**018**	**019**	**020**	**021**	**022**	**023**	**024**	**025**	**026**
PQ1 (Purpose of taking the medication)	X^C	X^I	X^L	X^L				X^L	X^O	X^O	X^I		X^O			X^I			X^L		X^O				X^O	X^L
PQ2 (Directions)	X^I	X^I	X^L	X^I	X^O		X^C	X^I	X^O	X^I	X^O	X^L	X^L	X^I	X^I	X^I	X^I	X^L	X^O	X^I	X^I	X^C	X^O	X^I	X^O	X^O
PQ3 (Monitoring)		X^O	X^C	X^O	X^O	X^C		X^C	X^O	X^I								X^L			X^L	X^C			X^L	X^L
Detected the drug-related problem			X		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	
n/a																										
Calcium																										
Prime questions	**001**	**002**	**003**	**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	**013**	**014**	**015**	**016**	**017**	**018**	**019**	**020**	**021**	**022**	**023**	**024**	**025**	**026**
PQ1 (Purpose of taking the medication)	X^O	X^O			X^L	X^O		X^L	X^O	X^O			X^O	X^O				X^L	X^O	X^O	X^O		X^O		X^O	
PQ2 (Directions)	X^C	X^O	X^I	X^I	X^O	X^O	X^C	X^I	X^O	X^I	X^O	X^C	X^L	X^I	X^I	X^I	X^I	X^I	X^O	X^I	X^C	X^C	X^L	X^O	X^O	X^I
PQ3 (Monitoring)		X^O						X^L						X^L					X^L	X^C	X^L	X^C	X^L	X^O		X^C
Detected the drug-related problem						X															X		X			

X^O: Asked with an open-ended question. X^L: Asked with a leading question. X^C: Asked with a closed-ended question. X^I: The pharmacist did not ask a question, but they had given the patient the information.

4.1.5 The pharmacotherapy workup

The pharmacotherapy workup elements were analyzed using the retrospective interviews with the interviewees (Table 4.6).

4.1.5.1 levothyroxine

When using the pharmacotherapy workup to assess the appropriateness of the medication, Levothyroxine on pharmacist checked for all four elements (indication, effectiveness, safety, and manageability). The majority of the interviewees checked for one of the elements; however, three pharmacists did not check for any element.

Indication

Eighteen pharmacists out of the twenty-six interviewees checked for the indication of the drug "levothyroxine." All eighteen pharmacists used elicited clinical information to check for the indication. Of the eighteen pharmacists, thirteen pharmacists used laboratory results to check for indication. The patient's past and current medical history was used to check for indication by five of the eighteen pharmacists.

Out of the nine pharmacists who did not check for indication, one pharmacist did not check for the indication at all. Four pharmacists assumed that the medication was indicated because it is a refill prescription. Three pharmacists did not check for indication; however, they considered the physician's decision for prescribing the medication as a check for indication.

Effectiveness

Seven pharmacists out of the twenty-six interviewees checked for effectiveness of the drug "levothyroxine." The laboratory results were the sole indicator of effectiveness in the seven instances. Out of the nineteen pharmacists who did not check for effectiveness, two pharmacists assumed that the medication was effective because it is a refill prescription. Five pharmacists relied on the physician’s decision for prescribing the medication as a check for effectiveness, and one of them believed that it is on the physician to check for effectiveness since they were the prescriber.

Safety

Seven pharmacists out of the twenty-six interviewees checked for one of the aspects for safety of the drug "levothyroxine"; however, the safety check was incomplete in all instances. Two pharmacists checked for drug-drug interactions by asking the patient if he is taking any other medications or supplements. Two pharmacists checked for dose safety. One pharmacist checked for drug allergy, and one checked the safety using the laboratory results.

Out of the nineteen pharmacists who did not check for any aspect of safety, three pharmacists assumed that the medication was safe because it is a refill prescription. Four pharmacists relied on the physician's decision to prescribe the medication as an indicator of safety.

Manageability

Three pharmacists out of the twenty-six interviewees checked for the manageability of the drug "levothyroxine." The three pharmacists relied on their interaction, and the prime questions asked to check for manageability. Out of the twenty-three pharmacists who did not check for manageability, one pharmacist believed that the physician is supposed to check for it, and two other pharmacists assumed that the medication is manageable by the patient since it is a refill prescription.

4.1.5.2 Calcium supplement

When using the pharmacotherapy workup to assess the appropriateness of Calcium supplement, no pharmacist checked for all four elements (indication, effectiveness, safety, and manageability). More than half of the interviewees checked for one of the elements; however, eleven pharmacists did not check for any element.

Indication

Eleven pharmacists out of the twenty-six interviewees checked for the indication of the Calcium supplement. All eleven pharmacists used elicited clinical information to check for the indication. Of the ten pharmacists, six pharmacists used laboratory results to check for indication, and five pharmacists used the patient's past and current medical history.

Out of the fifteen pharmacists who did not check for indication, four pharmacists relied on the physician's decision to prescribe the supplement as a check for indication, while three pharmacists assumed that the supplement was indicated since it is a refill prescription.

Effectiveness

One pharmacist out of the twenty-six interviewees checked for the effectiveness of the Calcium supplement. The pharmacist used laboratory results to check the effectiveness. Out of the twenty-five pharmacists who did not check for effectiveness, three pharmacists assumed that the supplement was effective because it is a refill prescription, and one pharmacist relied on the physician's decision to prescribe the supplement.

Safety

Three pharmacists out of the twenty-six interviewees checked for one of the aspects for safety of the Calcium supplement; however, the safety check was incomplete in the three instances. Two pharmacists checked for drug-drug interactions by asking the patient if he is taking any other medications or supplements, and one checked for drug allergy. Out of the twenty-three pharmacists who did not check for safety, four pharmacists considered the supplement was safe depending on that it was prescribed by a physician, and two assumed that the supplement was safe because it is a refill prescription.

Manageability

Three pharmacists out of the twenty-six interviewees checked for the manageability of the Calcium supplement. The three pharmacists relied on their interaction, and the prime questions asked to check for manageability. Out of the twenty-three pharmacists who did not check for manageability, two pharmacists believed that the physician is supposed to check for it, and two other pharmacists assumed that the medication is manageable by the patient since it is a refill prescription.

Table 4.6 Pharmacotherapy workup

Levothyroxine																											
PTW	**001**	**002**	**003**	**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	**013**	**014**	**015**	**016**	**017**	**018**	**019**	**020**	**021**	**022**	**023**	**024**	**025**	**026**
Indication	X^{M}	X^{M}	X^{L}	X^{R}	X^{R}	X^{L}	X^{R}	X^{L}	X^{L+R}	X^{M+P}	X^{R+P}	X^{R}	X^{M}	X^{M}		X^{P}	X^{P}	$X^{R+L=}$	X^{L}	X^{L}	X^{L}	X^{L}	X^{L}	X^{L}	X^{P+L}	X^{L}
Effectiveness		X^{L}		X^{L}	X^{L}				X^{R}		X^{R}	X^{L}		X^{P}		X^{P}	X^{R}	X^{L}					X^{L}	X^{P}	X^{P}	X^{L}
Safety	X^{X}			X^{R}	X^{X}		X^{R}	X^{P}		X^{L}	X^{P}	X^{R}	X^{A}	X^{D}	X^{D}	X^{P}			X^{D}						X^{P}	
Manageability				X^{R}	X^{C}			X^{P}		X^{R}								X^{C}								X^{C}
N/A																										
Calcium																										
PTW	**001**	**002**	**003**	**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	**013**	**014**	**015**	**016**	**017**	**018**	**019**	**020**	**021**	**022**	**023**	**024**	**025**	**026**
Indication	X^{P}				X^{R}	X^{L}	X^{P}	X^{L}	X^{M}	X^{M}	X^{R+P}	X^{R}	X^{M}				X^{P}	X^{R+L}	X^{P}	X^{M}	X^{L}	X^{L}	X^{M}		X^{P+L}	
Effectiveness									X^{R}		X^{R}			X^{P}			X^{R}						X^{L}			
Safety	X^{X}				X^{X}		X^{R}	X^{P}			X^{P}	X^{R}	X^{A}			X^{P}									X^{P}	
Manageability				X^{R}	X^{C}			X^{P}	X^{R}			X^{P}						X^{C}								X^{C}

X^{M}: used medical information. X^{L}: used laboratory results. $X^{P:}$ relied on the physician. X^{R}: relied on that it is refill. X^{X}: checked for drug-drug interaction. X^{A}: checked for drug allergy. X^{D}: checked for dose safety. X^{C}: checked through the conversation with the patient.

4.2 Qualitative Study Results

4.2.1 Thematic analysis

After a thorough and careful reading of the retrospective transcripts, three overarching themes that describe how pharmacists check for drug appropriateness emerged: assumptions, missed opportunities, and why to check.

4.2.1.1 Assumptions

The interviewees made several assumptions while checking the drug therapy appropriateness. This overarching theme contains two subthemes: "it's a refill so..", and "put-two-with-two-together."

"It's a refill so..": A handful of the interviewees justified not assessing the drug therapy solely on the assumption that since it is a refill, so there was no need to: *" based on it is a refill, he has been using them for six months, so based on that I dispensed the prescription, I did not see any lab results"(*RPh007), *" indicated? Because he is already using them for a while, so for sure they are indicated! it is just a refill prescription."* (RPh012), *"he has been on them for a while now, he came to get a refill so of course, he will be adherent to them"* (RPh009). Further, in some instances, the interviewees combined the refill assumption with other insufficient assessment tools: *"how did I decide that it was indicated? by asking him if it is a refill and that it is written on a prescription paper by a physician"* (RPh011), *"because he is already… I asked him if this is his first time or not, so he already told me that he has been on the Levothyroxine, the thyroid medication, for a year and a half and the Calcium supplement for six months…. if this was his first time taking the drug therapy, I would have asked him for his lab results to be sure"* (RPh005). On the other hand, the refill assumption was used to assess the appropriateness of drug therapy alongside some valid patient information on some instances: *"indicated? First of all, he did the "euthyrox" lab tests, and he has a condition that's why "he" prescribed him the Calcium supplement, and they are indicated since he has been on them for a while now, this is not his first refill"* (RPh009), *"Now, I asked the patient, and he said that he has been using it since forever since a year and a half and he did his thyroid tests and saw a physician for it*" (RPh018).

"Put-two-and-two-together": Some interviewees drew cursory and, at times, incorrect conclusions based on generalized or incomplete information and guessing and used these conclusions to guide their assessment process of the drug therapy, which in turn resulted in insufficient assessments. A few pharmacists' conclusions were based on the patient characteristics (sex, age, physical appearance): *"he is a young adult male "the patient," at his age, he won't have problems with hypertension or diabetes, so it "the drug therapy" won't affect anything"* (RPh018), *" now, the patient is healthy, he doesn't have other problems, although I didn't ask him if he does or if there are any other concurrent diseases, but based on the physical signs and symptoms he doesn't have any other problems."* (RPh002). For some pharmacists, assumed symptoms were the foundation of their conclusions, and the basis of their assessment: *"by the symptoms which happened to you "the patient" okay, so based on these symptoms the physician prescribed it "the drug therapy" to you "the patient."* (RPh021), *"okay, according to the symptoms and the lab results, if he "the patient" turned out to have a deficiency in the "thyroid" hormone then it is okay, and according to the symptoms which are fatigue, laziness, loss of concentration, and unexplained weight gain and stuff like that."* (RPh015). On one instance, the pharmacist projected the assumption of scaring the patient in order to make them adhere to the drug therapy:*" I will consult him "the patient," and I will educate him on the correct way to use the meds, but you have to scare him "the patient" a little bit so he would improve on the medication; basically this is how he "the patient" will adhere."* (RPh025). A handful of pharmacists used the fact of a refill to draw their conclusions about the patient attitude and the drug therapy: *"at the beginning, I asked him "the patient" if he is on it " drug therapy" and not skipping it, and it seems like he is, always taking it " drug therapy," not forgetting to take the meds, and it seems that he is oriented and doing his routinely lab tests."* (RPh018) *"Euthyrox is supposed to be chronic "medication," so he "the patient" is supposed to be adherent to it "Euthyrox."* (RPh001), *"based on that it "drug therapy" is a refill, and he has been continuously on it for six months, and he did not suffer from any side effects nor had any allergic reaction, it has to be safe."* (RPh007). On the other hand, a number of pharmacists used the safety profile of the drug therapy to draw vaguely generalized conclusions: *"to be honest, we don't even touch on the safety topic for these drugs, even if he "the patient" was elderly or pediatric, I mean in the case of the Calcium supplement we could rethink it for patients*

with renal problems, but in general, the meds are safe." (RPh020) *"you are a guy "the patient," and even if you "the patient" were a woman or a pregnant lady, it "the drug therapy" is safe, you know."* (RPh008). Two of the pharmacists were not sure about the safety of drug therapy. However, they relied on the assumption of safety profile: *"Calcium is safe for him to take "the patient," because it is a multivitamin, to be honest, I can't remember what the contraindications for Euthyrox are, but as far as I know it is safe, I mean Euthyrox won't be contraindicated for him "the patient" as a male or even if he was a female."* (RPh024), *" now, for the Calcium with the Euthyrox, I told you, I remember there is something there "interaction," but I am not sure, but honestly, probably by 90%, there is nothing "no interaction" but I am not sure 100%."* (RPh020)

One pharmacist judged that the patient is adherent on the assumption that patients who are on a single dosage drug therapy are adherent:*" …., but the once-daily drug is always "I think" convenient to the patient."* (RPh003).

4.2.1.2 Missed opportunities

The interviewees missed on several opportunities to gather information and further enhance the patient care process while checking drug therapy appropriateness. This overarching theme consists of three subthemes: "on the next refill," "incomplete evaluation," and "drug-related problems detected but not resolved."

On the next refill:

A pharmacist missed the opportunity to assess the effectiveness of the drug therapy throughout the patient-pharmacist interaction on the basis of checking it when the next refill occurs: *" we ask the patient in the future if he improved or not after increasing the dose from 75 mg to 100, these responses are checked when the patient refill his medications."* (RPh003). Some pharmacists believed they needed to wait for a period of time in order to check for effectiveness: *"for this case, we can't judge if the medication is effective, we have to wait for two months"* (RPh020), *"the medication would seem to be effective or not after a while from now."* (RPh022). On the other hand, a number of pharmacists missed the opportunity to assess the manageability of the drug therapy throughout the patient-pharmacist interaction, and decided to assess it when the patient comes for the next refill: *"when he "the patient" comes back again,*

*I would ask him…, you cant assess it "manageability" now, you have to wait for the next time."(*RPh014), *"when he "the patient" comes back again."* (RPh026).

Incomplete evaluation:

A pharmacist considered the patient's lack of complaining as an indicator for safety; therefore, there was no need for further evaluation: *"the patient didn't complain and seemed okay."* (RPh018). Several pharmacists checked for only one of many aspects for safety, focusing mainly on drug interactions and doses: *"I asked him if he "the patient" taking any other meds or supplements."* (RPh005), *"they are both safe, especially with the doses prescribed, there is nothing to worry about."* (RPh014), one pharmacist checked for drug allergies: *"I asked him if he has any drug allergies or something of that sort*." (RPh013). Meanwhile, a couple of pharmacists justified performing an incomplete evaluation on the absence of medical information: *"I can't decide that, because I don't have any lab results in front of me.!"* (RPh007). Unlike the expected, a few pharmacists did not consider an evaluation of manageability as part of their job: *"I should decide?? That's on the patient to do, as a pharmacist, I would educate him "the patient" …, but if the patient wants to take it "drug therapy" or doesn't want to, that's up to the patient."* (RPh006), *"that's for the patient to decide not for me."* (RPh023). Since the prescription was a refill, some pharmacists reported not checking for elements: *"based on that it is a refill."* (RPh017), "*if this was his first time taking the drug therapy, I would have asked him for his lab results to be sure"* (RPh005).

Drug-related problems detected but not resolved:

The majority of the interviewees did not detect the calcium supplement drug-related problem. However, of those who did, the majority were unsure and hesitant to resolve the problem: *"maybe the problem is with the calcium supplement being twice daily, hum, I don't know, I mean once daily is enough*." (RPh004), *"maybe there is a problem with the calcium being twice daily on 600mg dose, I mean, I don't know what the physician's opinion is on it."* (RPh019).

4.2.1.3 Why to check

The interviewees ignored assessing elements of the drug therapy problems for a couple of reasons. This overarching theme includes two subthemes: "reliance on physician" and "it's a supplement, no need to check."

Reliance on Physician:

Several pharmacists reported not assessing elements of the appropriateness of drug therapy, but instead relied on the physician's decision as an indicator for appropriateness: *"that it is prescribed by a physician*" (RPh011), *"his "the patient's" physician has his case, and he "physician" knows about it."* (RPh005), *"when a physician is the one who prescribed it "drug therapy" it has to be safe."* (RPh025)," *maybe his "the patient's" physician did some kind of tests."* (RPh001), *"based on the physician, the physician is the one who prescribed the therapy, and he "the patient" came to dispense it "prescription."* (RPh017). On the other hand, a number of pharmacists justified their reliance on the physician by the lack of access to patients' medical information (laboratory results, history): "*honestly, according to the physician, not me, since he "the physician" is the one who saw the lab results."* (RPh014). A pharmacist believed pharmacists are not able to change anything in a physician perception:

"We can't change it's a prescription "since it is a physician prescription, we didn't diagnose him "the patient", the physician did, so he "physician" knows better, so based on that we "pharmacist" can't change anything." (RPh016). A handful of pharmacists that manageability is to be assessed by the physician: *"by asking him "the patient" to follow-up with his physician."* (RPh011), *"I guess by the follow-up with his "patient's" physician."* (RPh008).

It is a supplement, no need to check:

A pharmacist reported that there is no need to assess the calcium supplement since it is not a medication: *"I didn't ask him about the calcium, because it is a supplement, so I considered it a routinely thing, maybe he "the patient" has osteoporosis, it "calcium supplement is less than a drug."* (RPh004). Several pharmacists reported that the calcium supplement can be taken without being indicated: *"we "pharmacist" didn't ask him "patient" about the calcium lab tests, but calcium is a supplement…,*

and as a supplement we "pharmacist" always say, it is really easy to take supplements like calcium without testing." (RPh005), *"for the calcium, you "the patient" said you don't eat or drink anything with calcium in it, so you are supposed to be taking it "calcium supplement" without being prescribed to you "the patient."* (RPh020). On the other hand, pharmacists did not assess the safety of the calcium supplement, considering the calcium to be safe since it is a supplement: *"calcium is safe, he "the patient" can take it since it is a multivitamin."* (RPh024), *"calcium is a supplement; it won't do any harm if taken after meals."* (RPh004), *"there isn't anything to be worried about with the calcium."* (RPh010).

5. DISCUSSION

5.1 Discussion

Pharmacists are considered to be the most accessible healthcare providers of the healthcare team(166). Therefore, pharmacists are responsible for providing their patients with pharmaceutical care services and guarantying the appropriateness of their drug therapy(167). Pharmacists are equipped with the knowledge and the training which enables them to check for drug appropriateness and to detect, resolve, and prevent drug-related problems. This study aims to describe how pharmacists in Jordan check the appropriateness of drug therapy using a mixed-method design to describe how Jordanian pharmacists check the appropriateness of drug therapy.

The interviewees were mostly young females working fulltime in a somewhat busy pharmacy with an average of five years of experience. Detected drug-related problems were commonly does-related problems. The interviewees were found to be highly supportive with a highly positive attitude towards pharmaceutical care and acknowledged the positive outcomes of pharmaceutical care on the pharmacy profession, the patients, and themselves. The study findings align with the results of national studies (14), where pharmacists also showed a highly supportive attitude towards pharmaceutical care.

Lack of reimbursement was reported to be a barrier to the implementation of pharmaceutical care by pharmacists in the literature (168). Therefore, reimbursement was seen as a way to encourage the provision of pharmaceutical care services by the interviewees. Pharmacists acknowledged and embraced their role in detecting, resolving, and preventing drug-related problems, which in turn would result in fewer hospitalizations, lower cost, and higher positive outcomes. A need for upskilling clinical knowledge was agreed upon as a necessary step in order to provide pharmaceutical care services.

The interviewees showed a one hundred percent support to the concept of pharmaceutical care, a much higher percentage of that of New Zealander pharmacists, where only fifty-five percent showed support to the concept of pharmaceutical care (88). The high support rate of the concept of pharmaceutical care means that the

implementation of pharmaceutical care services is applicable and somewhat easier to do.

The most reported barrier to pharmaceutical care was the need for pharmaceutical care training by more than ninety percent of the interviewees. This can be attributed to the absence of proper pharmaceutical care training during the time spent in pharmacy school and the pharmacy association mandatory training, as mentioned before. Pharmacy schools and regulatory bodies should take steps to integrate pharmaceutical care training into their training programs. Other studies reported the lack of training as a major barrier nationally and internationally (14, 85). The lack of a private counseling area was the second most reported barrier by the interviewees. This barrier was also reported by other studies (14, 87, 169). This can be changed by the enactment of new laws regarding the lay-out of pharmacies (170).

Documentation skills are imperative when providing pharmaceutical care services. The lack of such skills was reported as a barrier by the interviewees , which is found to be a national (14) and an international (86, 87) barrier for the provision of pharmaceutical care services.

Pharmaceutical care is meant to be provided by all members of the healthcare team, which means communication between the health team members is essential. The interviewees reported difficulty in communicating with physicians as a barrier alongside the belief that physicians would not accept the role of pharmacists in providing pharmaceutical care. The same results were reported in other national studies (5, 14), while internationally, pharmacists were less worried about the acceptance of physicians to their role in providing pharmaceutical care (88, 171). However, the literature reported that Jordanian physicians showed support and acceptance of the role of pharmacists in pharmaceutical care (155, 159, 172, 173). This can be the result of a lack of communication skills. Pharmacy owners, the Jordan pharmacists association, as well as pharmacy schools should work on upskilling communication skills of students and practicing pharmacists.

The lack of data on the benefits of pharmaceutical care was considered a barrier by the interviewees. Most of the data available on the benefits of pharmaceutical care are from the North American and European literature. The concept of pharmaceutical care

is relatively new to Jordan. Therefore, the literature is still developing, and more studies on the benefits of pharmaceutical care on the national level must be done. However, in the past ten years, a decent number of studies were carried out in Jordan to evaluate the benefits of pharmaceutical care. Here comes the role of continuous education to keep pharmacists updated with the new information and results.

The lack of access to patients' medical data was reported a barrier by more than two-thirds of the interviewees. This barrier was also reported by other Jordan-based (14), regional (174), and international studies (88). Pharmacists who provide patient-centered care were found to use electronic health records to elicit information about medication history and laboratory values (175), ultimately helping them in providing better healthcare services. Jordan has a national electronic health records database, "Hakeem." Allowing pharmacists access to "Hakeem" might result in providing better healthcare services. Although, for the present time, better communication with physicians would resolve this barrier.

The interviewees considered patients' economic status and acceptance as barriers to the provision of pharmaceutical care in their practices. Similar results were reported by another study in Jordan (14). In contrast, several studies in Jordan reported that patients are willing to pay for a pharmaceutical care service that would result in improving healthcare outcomes (160, 176).

Understanding the patient's medication experience is essential in evaluating drug therapy appropriateness, and detecting, resolving, and preventing drug-related problems. Another way pharmacists use the information they elicited about the patient's medication experience is to tailor the patient education provided to the patients (177). The interviewees focused on eliciting information about the patient's medication history during the assessment process. All pharmacists elicited information about medication history, and most of them elicited information about the patient's needs and concerns.

Most of the interviewees gathered clinical information about the patient's medical condition. Primarily, pharmacists gathered information about laboratory values.

The interviewees used the three prime questions to elicit information about the indication, direction, and monitoring of the drug therapy. When addressing "PQ1" with

the patient, the interviewees were more likely to use an open-ended question when eliciting information about the calcium supplement than when eliciting information about the drug "Levothyroxine." Leading questions were the main way used by pharmacists when asking about the indication of the thyroid drug.

The interviewees were found to focus the direction regarding both of the calcium supplement and the drug "Levothyroxine." When addressing "PQ2" with the patient, more than half of the interviewees did not ask a question; rather, they used the monologue to address it. Leading questions and using the monologue were the two ways the majority of pharmacists used to check for directions for the calcium supplement. The interviewees detected the patient's drug-related problem(s) by addressing "PQ2."

The interviewees were less focused on the monitoring process. Only the half checked for it for the drug "Levothyroxine," and the third for the calcium supplement. This was also reported by other studies where pharmacists were found to be less focused on the monitoring process(178). When addressing "PQ3" with the patient for both the drug "Levothyroxine" and the calcium supplement, the interviewees used questions (open-ended, closed-ended, and leading) to elicit information instead of using the monologue.

The interviewees were found to focus on detecting a drug therapy problem when assessing the prescribed drug "Levothyroxine" more than when assessing the calcium supplement. Pharmacists worldwide lack the necessary therapeutic knowledge of dietary supplements, as reported by systematic review study (179).

When developing a care plan, all the interviewees focused on determining an intervention to prevent and resolve detected drug-related problems and achieve goals mostly through patient education. Most of the interviewees discussed resolving the detected drug-related problem with the patient. None of the interviewees tried to schedule a follow up with the patient. Apparently, the interviewees ' care was focused on the "present time" interaction without considering establishing a continuous therapeutic relationship with the patient. It may be attributed to the study design of using a simulated patient scenario; therefore, the interviewees did not consider setting a follow-up with the patient.

Follow-ups with pharmacists have positive outcomes for the patients in the long term (180). The follow-up process was vastly ignored by the interviewees. The four elements of the follow-up process were only addressed once. As mentioned above, the interviewees seemed to focus on the "present time" interaction without considering ensuring futuristic positive outcomes, neither building a continuous therapeutic relationship with the patient. Follow-ups with pharmacist have positive outcomes to the patients in the long term

The interviewees showed a refill bias in almost all the patient care process steps. The drug therapy was assumed to be indicated, safe, effective, and manageable on the basis of a refill. Therefore, the interviewees gathered less information to assess the appropriateness of drug therapy. This finding was also reported by another study that stated that pharmacists were biased against assessing refills (12). Incomplete and holistic information was also used by pharmacists to assess the drug therapy. Pharmacists drew assumptions based on incomplete elicited information and generalized nonspecific knowledge about the drug therapy. This led pharmacists to take precipitate decisions concerning the drug therapy. The literature explained this intuitive thinking as a sign of experience(181), which might lead to overlooking details.

The pharmacist missed on opportunities to perform a complete evaluation of the drug therapy. This is due to pharmacists missing on opportunities to elicit information from the patient by not engaging them in the conversation. Some pharmacists asked questions about only one aspect of the elements of the pharmacotherapy workup. Although, the interviewees considered a lack of access to patients' information as a barrier to pharmaceutical care provision. A similar study reported missed opportunities as a theme, as well (12). Hesitancy to resolve detected drug-related problems was also a reason to missed opportunities to improve the patient's drug therapy.

Pharmacists did not check for drug appropriateness but rather relied on the physician's decision to prescribe the drug therapy. Pharmacists are responsible for checking the appropriateness of the drug therapy and expected to check and correct errors regarding the drug therapy. Physicians count on pharmacists to correct their errors when dispensing the therapy (182). Pharmacists are the drug experts, and by detecting, resolving, and preventing drug-related problems can improve the patient's health

outcomes and quality of life. Pharmacists were biased against assessing the appropriateness of the dietary supplement in favor of the medication. Studies have reported that pharmacists have inadequate knowledge about dietary supplements in general and low knowledge considering supplements' safety and efficacy. (179, 183)

The average experience years of the interviewees was almost five years, which means that most of the pharmacists interviewed had graduated from pharmacy schools five years ago. That could mean that the interviewees had not taken adequate number of patient-oriented courses during their time in pharmacy schools, nor did they had a more patient-oriented training like the ones that the pharmacy schools nowadays are starting to offer, which in turn could explain some of the interviewee's poor performances and lack of communication skills with either the patient or the physician. Patient-oriented training is essential, imperative, and absolute in order for pharmacists to provide pharmaceutical care practice. Pharmacy schools, employers, Jordan pharmacists association, and the ministry of health should provide the much needed up to date training programs to pharmacy students and pharmacists alike.

5.2 Recommendations

More studies must be carried out in order to investigate further and assess how pharmacists evaluate drug therapy in Jordan. This study may pave the way for future research. Jordanian pharmacy schools must update their curricula to include more patient-centered subjects. Patient-centered training programs are imperative nowadays, pharmacy schools around the kingdom and the JPS are to forsake the outdated product-centered training programs in order to facilitate the implementation of pharmaceutical care in Jordan. Joined Communication skills workshops are needed to improve communication between pharmacists and physicians. Regulatory bodies must understand the need for allowing pharmacists access to medical records, which are imperative to their evaluations of drug therapy where they are used to detect, resolve, and prevent drug-related problems, which would result in improved therapeutic outcomes and decreased costs. Regulatory bodies and pharmacy owners must understand the need for regulating pharmacies' designs and requiring a private consultation area to be present in every pharmacy premises.

Pharmacists must embrace their roles as healthcare providers, which requires them to upskill their clinical knowledge, documentation skills, and engage their patients and allow them to take part in making decisions. Furthermore, pharmacists must not rely on routines while checking the appropriateness of drug therapies and understand that each case is unique, and each patient has a different story to tell. Pharmacists have to recognize the importance of follow-up evaluations and start working on having a long-term therapeutic relationship with the patient. Lastly, pharmacists are advised to keep up to date with what is new to the pharmacy profession nationally and internationally.

5.3 Limitations

Firstly, this study was conducted on a small sample size working in the same chain pharmacy. Secondly, due to the exploratory descriptive nature of the qualitative study, results might not be generalized beyond the study sample. Thirdly, the simulated case scenario might not be representative to the real-world cases. Fourthly, due to the data collection technique, a few of the interviewees might had been anxious and performed in a way that did not represent their practice. Fifthly, social desirability bias may had modified some of the pharmacists' practice, trying to perform in a better way in order to look better in the eyes of the researcher and their management. Sixthly, a recall bias may have an effect of the pharmacists' retrospective answers, in the retrospective interviews, pharmacists may unintentionally reconstruct their answer due to retrieving longtime memory. Seventhly, at first the researchers aimed to record pharmacists' concurrent think-aloud, but the first two interviewees struggled with the technique and no sufficient data was obtained, therefore, the researchers chose to record retrospective think-aloud interviews instead of concurrent think-aloud recordings. Furthermore, the main researcher was responsible for conducting all interviews with pharmacists. This may have introduced bias to the study and in the analysis according to his personal opinions developed while collecting the data.

6. CONCLUSION

6.1 Conclusion

To our best knowledge, this is the first study in Jordan, that aimed to describe how pharmacists check for a refill drug appropriateness. The interviewees had positive attitudes towards the concept of pharmaceutical care and reported willingness to provide pharmaceutical care services in their practice. That being said, a person would expect the interviewees to provide an adequate assessment for drug therapy. Unfortunately, that was not the case with the majority of the interviewees, where the interviewees performed an incomplete evaluation of the refill drug therapy, vastly overlooking assessing the safety and manageability of the refill. The interviewees exhibited two kinds of bias throughout the study: a refill bias and a supplement bias, where pharmacists overlooked assessing the appropriateness aspects of the drug therapy on those bases.

The majority of the interviewees performed two steps of the patient care process. The interviewees elicited clinical information and medication history from the patient throughout the assessment step. Clinical information, especially laboratory results, played a major role in the interviewees 'assessment of the indication and effectiveness of the refill. Lack of access to patients' medical records was considered a barrier by the interviewees. Therefore, allowing pharmacists access to patients' medical records would provide them with much-needed information to help navigate their assessment of drug therapy and spare them some time to elicit information about the patient's concerns and needs.

The majority of the interviewees often used a monologue to gather information from the patient rather than trying to engage the patient with them. Furthermore, the interviewees relied on inconclusive, generalized, and pre-decided assumptions and intuitions to assess the appropriateness of the refill. This might explain why the need for pharmaceutical care training was the most reported barrier by the interviewees. The interviewees did not connect the elicited information to their cognitive assessment of the refill drug therapy.

The difficulty in communicating with the physician was a major barrier reported by the interviewees. However, a handful of interviewees relied on the physicians' decisions to ensure the appropriateness of refill therapy, which indicates that the physician's opinion plays a huge part in the pharmacist assessment process. Better communication between pharmacists and physicians would improve the assessment of drug therapies in the future.

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APPENDIX

Appendix A:

Questioner

Demographics:

Age: **Sex: Male** ☐ **// Female** ☐

Number of practice years:

Are you a: Fulltime employee ☐ **// Part-time employee** ☐

On a daily average how many prescriptions do you dispense?				
What is the average number of drug-related problems identified per week?				
What is the most common drug-related problem identified?	**Dose issues**	**Drug-drug interaction**	**Adverse drug reaction**	**Adherence**
	○	○	○	○

How busy is your usual day in the pharmacy?				
Slow	**Slow with busy times**	**Steady**	**Busy with slow times**	**Busy**
○	○	○	○	○

	Strongly Disagree ▼	**Disagree ▼**	**Neutral ▼**	**Agree ▼**	**Strongly Agree ▼**
1.Pharmaceutical care is the right direction for the pharmacy profession to be headed	○	○	○	○	○

2. I do not think that it is practical to provide pharmaceutical care to patients in Jordan	○	○	○	○	○
3. If there was an extra payment for providing pharmaceutical care, the focus for the majority of community pharmacists would change	○	○	○	○	○
4. I think that my provision of pharmaceutical care would result in a significant benefit to patients	○	○	○	○	○
5. The introduction of pharmaceutical care will benefit the pharmacy profession.	○	○	○	○	○
6. Pharmaceutical care should be practiced only after obtaining an MSc in clinical pharmacy or a PharmD	○	○	○	○	○
7. I think there must be some sort of certification, approval, accreditation for providers of pharmaceutical care.	○	○	○	○	○
8. I fully support the concept of pharmaceutical care	○	○	○	○	○
9. It is the physician role to identify drug therapy problems and ensure that the patients' health outcomes are ultimately achieved since he or she prescribed drug therapy	○	○	○	○	○
10. Pharmaceutical care requires major upskilling of clinical knowledge	○	○	○	○	○
11. Physicians and other health professionals will not support a pharmaceutical care role for pharmacists	○	○	○	○	○
12. The future success of pharmacy will depend on the provision of professional services other than dispensing	○	○	○	○	○
13. Patients will not accept care provided by the pharmacist	○	○	○	○	○

How much do you agree or disagree with the following statements?

	Never (0%) ▼	Rarely (1-19%) ▼	Occasionally (20-39%) ▼	Sometimes (40-59%) ▼	Frequently (60-79%) ▼	Usually (80-99%) ▼	Always (100%) ▼
1. Introduce yourself as the pharmacist	○	○	○	○	○	○	○
2. Ask for the purpose of the medication	○	○	○	○	○	○	○
3. Ask how the patient is taking his/her medication	○	○	○	○	○	○	○
4. Ask what side effects are the patient experiencing	○	○	○	○	○	○	○
5. Evaluate if the medication is indicated ,effective, safest and most convenient	○	○	○	○	○	○	○
Collecting patient data							
6.Asking patients for all necessary information regarding his or her medications, diseases and medical history	○	○	○	○	○	○	○
7. Keeping records of patient's medications	○	○	○	○	○	○	○
8. Keeping records of patients' demographics and medical history	○	○	○	○	○	○	○
Drug-related problem identification and prevention							

How much do you agree or disagree with the following statements?

presence of actual or potential drug-related problem	○	○	○	○	○		
10.Providing advice/education on the appropriate medicines use to prevent possible drug-related problems	○	○	○	○	○	○	○
11. Providing advice/education on the adverse effects of medicines to prevent possible drug-related problems	○	○	○	○	○	○	○
Drug-related problem solving and care plan formulation							
12. Resolving identified drug-related problems directly with the patient	○	○	○	○	○	○	○
13. Advising patients and providing education on lifestyle and non-pharmacological opinions	○	○	○	○	○	○	○
14. Contacting the physician to discuss drug-related problems identified and help to formulate a patient-specific care plan	○	○	○	○	○	○	○
15.Referring patients to physicians upon your recommendations	○	○	○	○	○	○	○
Drug therapy monitoring							
16. Monitoring compliance with medicines	○	○	○	○	○	○	○
17.Following up on the patient's progress to assure the achievement of desired outcomes	○	○	○	○	○	○	○
18.Calling the patient at home for monitoring or assessment of therapy and outcomes	○	○	○	○	○	○	○
19.Offering feedback to the patient's physician about his or her progress with the care plan	○	○	○	○	○	○	○

	Strongly Disagree ▼	Disagree ▼	Neutral ▼	Agree ▼	Strongly Agree ▼
1.Level of understanding of pharmaceutical care.	○	○	○	○	○
2.Lack of documentation skills.	○	○	○	○	○
3.The need for pharmaceutical care training.	○	○	○	○	○
4.Lack of private counselling area.	○	○	○	○	○
5.Lack of staff.	○	○	○	○	○
6.Lack of appropriate management systems (e.g. workflow).	○	○	○	○	○
7.Lack of access to patient medical records.	○	○	○	○	○
8.Lack of data on the benefits of pharmaceutical care.	○	○	○	○	○
9.Lack of support from stockholders/ pharmacists' association /regulatory bodies.	○	○	○	○	○
10.Lack of patient acceptance.	○	○	○	○	○
11.Econimic status of patients.	○	○	○	○	○
12.Waiting time for patients.	○	○	○	○	○
13.Physicians will be against it.	○	○	○	○	○
14. Difficulty communicating with physicians.	○	○	○	○	○

Appendix B:

Hypothyroidism Simulated Case

Patient Name: Taqi Gender: M Age: 25

Weight: 65 Kg Hight: 172 Insurance: Non

Diagnosis: “Primary Hypothyroidism”

Diagnosed almost 1.5 years ago, after suffering of increased fatigue, weight gain, increased sensitivity to cold weather, dry skin and goiter.

First Lab results showed an elevated TSH levels, and low T4 levels

TSH result:(12.3 mU/L) T4 result:(3.4mg/dL)

L-thyroxine initial dose 75 mcg daily at bedtime.

Last Lab results: 16/11/2019

TSH:(5.2mU/L) T4:(5.9mg/dL)

Dose adjustment was required (increased to 100 mcg daily).

Patient Illness History:

Taqi is Lacteous intolerant / penicillin allergy

Taqi’s GP recommended Calcium supplement because of his Lacteous intolerances, twice daily one in the morning and one at bedtime.

Medications:

L-thyroxine 100mcg at bedtime daily.

Calcium supplement: twice daily once in the morning and once at bedtime.

No other medications or herbal meds.

Sleep at 12 dinner 8

Appendix C:

Detailed Demographics

Participant	Gender	Age	Years of Experience	Store Busyness	Number of DRPs detected per week	Common DRPs Detected					Ask PQ1	Ask PQ2	Ask PQ3	Evaluate PTW elements
						Unnecessary Medication	Dose Issue	Drug interaction	Adverse reaction	Compliance				
RPh01	Female	24	1	Busy	11	X	X			X	Often	Sometimes	Rarely	Often
RPh02	Male	34	11	Somewhat busy	10		X	X	X	X	Often	Often	Often	Often
RPh03	Male	29	6	Somewhat busy	7		X				Usually	Often	Often	Usually
RPh04	Male	28	3	Slow with busy times	3		X				Often	Sometimes	Sometimes	Often
RPh05	Female	32	10	Somewhat busy	2		X		X	X	Rarely	Rarely	Rarely	Usually
RPh06	Male	36	13	Slow with busy times	3					X	Usually	Often	Rarely	Sometimes
RPh07	Female	23	1	Somewhat busy	2		X			X	Usually	Always	Usually	Often
RPh08	Female	30	8	Busy	4		X			X	Always	Always	Often	Always
RPh09	Female	24	1	Slow with busy times	20		X			X	Always	Usually	Usually	Usually
RPh10	Female	27	4	Busy	10		X	X	X	X	Often	Usually	Sometimes	Usually
RPh11	Female	25	3	Slow with busy times	3		X			X	Often	Sometimes	Rarely	Rarely
RPh12	Female	25	2	Busy	3		X				Usually	Usually	Usually	Always
RPh13	Female	25	3	Slow with busy times	1		X		X		Usually	Always	Often	Always
RPh14	Female	26	4	Somewhat busy	7		X				Usually	Always	Often	Sometimes

RPh15	Female	25	1	Somewhat busy	1					X	Always	Always	Always	Often
RPh16	Female	30	6	Slow with busy times	2		X	X			Rarely	Often	Often	Sometimes
RPh17	Female	26	4	Slow with busy times	2		X			X	Often	Sometimes	Usually	Usually
RPh18	Female	26	3	Somewhat busy	7		X	X	X	X	Often	Usually	Sometimes	Sometimes
RPh19	Female	30	6	Slow with busy times	2		X			X	Usually	Always	Sometimes	Often
RPh20	Male	29	8	Somewhat busy	8		X			X	Usually	Always	Always	Always
RPh21	Male	29	7	Slow with busy times	12		X			X	Rarely	Always	Usually	Often
RPh22	Female	28	4	Somewhat busy	5		X	X			Sometimes	Usually	Sometimes	Often
RPh23	Female	31	7	Somewhat busy	2		X	X			Often	Usually	Sometimes	Usually
RPh24	Female	25	1	Busy	7		X			X	Sometimes	Often	Rarely	Often
RPh25	Male	23	1	Somewhat busy	5		X		X	X	Usually	Usually	Sometimes	Often
RPh26	Male	26	2	Slow with busy times	6		X			X	Sometimes	Often	Usually	Usually