EXPLORATION OF THE IMPACT OF INFORMATION AND COMUNICATION TECHNOLOGY (ICT) DEVELOPMENT ON COMMUNITY PHARMACY PRACTICES IN NIGERIA

BY

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DECLARATION

I hereby certify that this material, which I now submit for assessment on the program of study leading to the award of the MSc in Pharmaceutical Business & Technology, is my own; based on my personal study and/or research, and that I have acknowledged all material and sources used in its preparation. I also certify that I have not copied in part or whole or otherwise plagiarized the work of anyone else, including other students.

YUSUF, Saliu Adeleke	**ORLA Veale** (Supervisor)
Date:	Date:

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TABLE OF CONTENTS

ABSTRACT

The introduction of the concept of pharmaceutical care as well as integration of ICT-based techniques into the practice of community pharmacy has reshaped the professional job functions of modern day community pharmacists as attention is being given in continuum to patient-oriented services. Consequently, issues such as medication error, undue waiting time, prescription problems to mention a few are being effectively addressed and managed courtesy of ICT-based techniques such as e-prescription, telecare, barcode scanning to etc. usage in the work station of community pharmacists. These techniques among others have also been observed and reported to reduce the workload of community pharmacists which in turn create more time to offer patient-focused services.

The present study explored the use of ICT-based techniques as well as the level of professionalism pharmacists in the practice of community pharmacy in Nigeria. Community pharmacy is one of the facilities in the Nigerian primary health sector rendering health services to patients of which majority are financially constrained and not covered by health insurance. The study was modelled on qualitative research pedagogy and specifically conducted in the selected locality of Eti-Osa LGA, Lagos state Nigeria. Fifteen (15) licensed and practicing community pharmacists were sourced for the exploratory research study using purposive and snowballing sampling techniques and seven (7) were successfully engaged with 10 pre-drafted questions through semi-structured interview that averaged 37.5 minutes on mobile phone conversation. Each

of the interview sessions was audiotaped, transcribed, coded and subjected to thematic data analysis. Five key themes were identified based on respondents' opinions and it was found that community pharmacists in study's locale are aware of the use of ICT-based techniques such as Health Information Technology, Electronic Prescription and Telecare services in their line of duty as seen in the developed world but their use in the Nigerian environment is inexistent. This study unraveled the factors including poor infrastructural facilities, lack of technical skills, financial constraints, poor public reception as the major bottlenecks behind the nonexistent of these ICT-based techniques in the professional workstation of of community pharmacist in Nigeria. Consequently, this paper proffered measures to bring about the existence of these techniques as respondents welcomed the idea of their introduction and felt it would enhance their professional job functions.

Interestingly, the present work also established a theorized concept of "Professional Marginalization" and "Professional Exclusion" as engaged community pharmacists overtly stated that they had no well-defined place in the Nigerian public health system owing to the fact that they enjoyed little or no "professional rapport" with other health professionals when it comes to patients' health issues. Non-existence of ICT-based techniques was said to contributed to this and respondents thus call for a way to be involved by integrating ICT-based techniques explored here along with others seen in the advanced world in their work station. Respondents felt that their professional stance can be redefined with ICT-based technique. The research thus conclusively calls for future research to the done in staking claim for the theorized concept of professional marginalization and professional exclusion established here.

LIST OF TABLES, FIGURES AND ACRONYMS

ACPN: Association of Community Pharmacists of Nigeria

APHA: American Public Health Association

API: Active Pharmaceutical Ingredients

ASHP: American Society of Health-System Pharmacists

CPs: Community Pharmacists

EHR: Electronic Health Record

E-Rx: Electronic Prescription

FMD: Falsified Medicine Directives

HIT: Health Information Technology

ICT: Information and Communication Technology

ISMP: Institute for Safe Medication Practices

LGA: Local Government Area

MCPD: Mandatory Continuing Professional Development Program

OTC: Over the Counter

PCN: Pharmacists Council of Nigeria

POM: Prescription Only medicine

POMCD: Prescription-only Medicine-Controlled Drugs

WHO: World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

A stable, quality and consistent healthcare system is one of the crucial entities in sustaining and enhancing the development of any nation. The quality of the healthcare system is dependent on various healthcare provision bodies, regulatory agencies, and drug agencies, trained and qualified personnel/experts among host of other stakeholders who all operate with the grand aim of providing quality healthcare services that promote, sustain and enhance quality life of all and sundry. The health system is also subjected to other factors including quality education, technological infrastructures, influence of both the corporate government and non-government organizations to mention a few (Health Development, 2007). This is because the healthcare system is a highly open system that is always prone to novel changes and innovative improvements. Within the healthcare environment, pharmacists are important personnel in the system, they have versed knowledge on drugs and medicines— formulations, how and what physiological response they elicit in patients to mention a few. In the past, pharmacists are perceived as "product-centric" health professionals, however, and in recent ages, their activities as professionals in the health sector have broadened from mere product-oriented functions of dispensing and distribution of medicines and health supplies to a more rounded services of increased focus on patients rather than medicines itself, administrative roles as well as other public health functions (American Public

Health Association, 2006). Hence, pharmacists are continually taking up centralized placement and playing crucial role in communities and clinical settings as public health can benefit from pharmacists' unique expertise that may include pharmacotherapy, access to care, and prevention services as well as being an easily accessible resource for health and medication information (American Public Health Association, 2006).

Community pharmacy has become a novel and popular facility in the healthcare system. It has become one of the most accessible healthcare facilities to the general public whose adherents (community pharmacists) provide pharmaceutical care services that covers drug and medication dispensing, health guidance and counseling, promotion of healthy lifestyles among others to patients (WHO, 1993; American Public Health Association, 2006). The practice of community pharmacy is a globally accepted practice in both the developed and developing world as it comes with a lot of benefits to patients and the health sector at large. Such benefits include provision of a reliable and trusted environment in which medication error(s) can be reduced, safety can be enhanced and hence reduction in the cost of rendering quality healthcare services. Thanks to the influx of technology into the practice of community pharmacy and health system at large, the functions of pharmacists and the practice of community pharmacy itself have been improved dynamically as the integration of computerized system and other ICT-based techniques have proven to be crucial in offsetting medication error (e.g. the use of barcode medicine identification with scanner), more closeness to patients and hence improved linkage between patients and specialists. (American Public Health Association 2006)

Nigeria, a democratic secular state in West Africa, is characterized with large population of 206 million people and large economy (20^{th} in the world). The healthcare system of Nigeria is being managed concurrently by three tiers of government along with the private sector of which

community pharmacy practices has become popular in the country in recent years. Owing to increasing population of Nigeria with limited infrastructural development and advancements in the healthcare sector as seen in the corresponding advanced world, the practice of community pharmacy which can act as "buffer" between the increasing population and the various specialists in the clinical settings is on the arise. Although graduates of different schools as well as healthcare professionals (pharmacists) with years of experiences have been diving into the practice of community pharmacy in recent years as way of improving the quality of pharmaceutical care rendered to the public, the practice is still somehow off the standard seen in the advanced worlds in which the practice of community pharmacy have morphed from an ordinary cog to one of the driving motors of the health sector. Various factors including but not restricted to local and national policies, regulatory bodies and association policies, lack of technical know-how, reduced technological advancements and usage can be attributed to the sub-par performances seen in the practice of community pharmacy and its overall reception in the Nigerian healthcare system. It is based on this premise that this present research work explores the practices of community pharmacies in Nigeria and specifically investigates the impact of information and communication technology on the said practice in a selected locality of Nigeria.

1.2 Research Scope and Rationale

This study is a qualitative research archetype. The target population is composed of health professionals (specifically community pharmacists) associated with the Nigerian healthcare system within Eti-Osa Local Government area of Lagos State, Nigeria.

1.2.1 Research Basis

The present study is based on the exploration of the practice and role of community pharmacy in the Nigerian healthcare system. It centers on the rationalization of the impact of ICT-based techniques in the work practice of community pharmacists in Eti-Osa Local Government of Lagos State, Nigeria. The ICT based techniques that are explored in the present study include:

- Health information technology (i.e. patients e-health record)
- Electronic prescription service (E-Rx)
- Telecare/Telemedicine

By exploring the work practice and hence the use of these ICT based techniques by community pharmacists in the selected locality of Eti-Osa Local Government Area of Lagos State, the research thus seeks to improve the practice of community pharmacy through information and communication technology in the area and hence, in a country plagiarized by year-on-year influx of community pharmacy stores.

1.2.2 Problem Statement

Pharmaceutical care services are old practices which continue to evolve across generations. Over the recent years, pharmaceutical care services rendered by pharmacists have shifted from the customary compounding method, to the popular count and pour system which was dominant in the 1990s and to the now popular patient-centric practice that reflects in the increasing extended services rendered to patients by health system professionals of which community pharmacists represent a large quota. Contrary to the attention given to community pharmacists as well as the level of professional advancement seen in the practice of community pharmacy in the developed

world such as United States, Canada, Australia, Ireland and other European states, the practice of community pharmacy in the developing countries especially Nigeria is still below the acceptable standard. In Nigeria, the practice of community pharmacy is overshadowed by various limiting factors. These include limited professional experience of practicing pharmacist, little or non-adoption and usage of ICT technology (use of computerized system and networks, e-Health recording, Electronic prescription services, telecare among others) by various community pharmacy stores as well as ineffective regulatory policies. These are few of the most pronounced bottlenecks that can be ascribed to the low standard level seen in the practice of community pharmacy across the federation. Lagos state— a commercial hub with large population —continues to witness the influx of community pharmacy stores of which majority are affected by one or several of the preceding stated limiting factors which in turn have net impact on the Nigeria healthcare system at large. Therefore, the present work explores the practice of community pharmacy in Lagos state, Nigeria and investigate extensive use of ICT techniques as "novel tools" which will enhance the practice of community pharmacy in the state and hence the Nigerian Healthcare system at large.

1.2.3 Research Aim and Objectives

The aim of the present work is to explore the practice of community pharmacy in Lagos state through the eyes of community pharmacists and their perception on the use of the novel information and communication technology ICT, and its effective implementation in the practice of community pharmacy in state and hence the Nigerian communities.

The interwoven objectives include:

- Exploration of the professionalism, work practice and ethics of community pharmacist in Lagos state, Nigeria
- Exploration of the observed non-adoption and hence ineffective usage of ICT-based techniques such as the use of computerized network in recording, storing and accessing patients' health information; electronic prescription as well as telecare services by community pharmacists in the research study locality.
- Identify the bottlenecks and hence barriers responsible for non-employment/ineffective use of ICT in the practice of community pharmacy which overshadowed the field in Nigeria.
- Explore the importance of and how ICT-based techniques usage in the practice of community pharmacy would improve and thus benefit all stakeholders associated with the Nigerian healthcare system.
- Proffer novel and insightful ideas and solutions that can lead to the effective adoption and full implementation of ICT techniques across various community pharmacies in Lagos state and thus improving the Nigeria health care system

1.2.4 Significance of the Research

Studies on the impact of information and communications technology development on community pharmacy practices have a long standing history in some countries, in particular the United Kingdom and the United States of America. However, in Nigeria some studies have been carried out, but not any has been carried out on study that correlates the impact of information and communications technology on the development of community pharmacy practices.

This study is conducted with a potential target of providing insight on how to improve the work practice of community pharmacists through the adoption and extensive use of the novel ICT-based techniques in the community pharmacy line. Also, this research has potential to be of benefits to all stakeholders associated with the practice of community pharmacy in Nigeria of which health professionals and their regulatory bodies (e.g. Pharmacist Association of Nigeria), Nigerian patients and the nation's healthcare system are the major beneficiaries.

1.2.5 Research Ethics, Strengths, and Limitations

The present work is modeled on the use of qualitative research data. All respondents' opinions that were used in the research work were collected based on individual (pharmacist) respondent's consent on what they will be used for. As with all research works, the present work has limitation of its own which reflect in the relatively small size of the sample used in the research study. In other words, this small sample size might not to a greater extent, aptly capture the practice of community pharmacy in the federation owing to the large population of community pharmacies that spread across the 36 states of the nation. However, this limitation was counterbalanced in other to offset bias and anomalies. Hence respondents were specifically sampled from the well-known community pharmacies in the nation's largest commercial hub of Lagos state. Furthermore, all respondents' opinions were subjected to thorough and critical analysis and the various opinions were weighed with established thoughts and perception in other literatures which helped in establishing lucid and convincing facts from which sound decision and rational conclusion were made.

1.3 Theoretical Framework

As part of the functional building blocks the present work is laid on, three theoretical constructs described in other literature were adopted and re-ascribed for the present study (Petrakaki et al., 2011). The three constructs broadly capture and aptly rationalize pharmacy as profession based on "abstract knowledge", establishes how information and communication technology (ICT) broadly reshapes all work practices and hence community pharmacy itself in the circus of healthcare system, and finally re-solidify the stance of community pharmacists in the health system. The benefit of these theoretical constructs which are explained under the succeeding headings is that they were chosen to act as frame of reference in rationalizing respondents' opinions based on the qualitative survey research questions 'tailored' to them.

1.3.1 Conceptualizing Pharmacy as a Profession

The concept of professionalism has been described and explained by various authors. Earliest explanations include profession as a learned trade rendered in in varying degree and remunerated for. In the words of Allan Bullock and Stephen Trombley (1999) "profession arises when any trade or occupation transforms itself through the development of formal qualifications based upon education, apprenticeship, and examinations, the emergence of regulatory bodies with powers to admit and discipline members, and some degree of monopoly rights". According to Abbot (1998) professional work practice has to do with abstract knowledge of science, logic and future practical value-based knowledge which thus legitimizes professionals' status and confers prestige to its practitioner (Abbot,1998; Causer and Exworthy, 1998). These two definitions established that a profession is an institutionalized and formally learned trade, backed by education

in which the practitioners hence called professionals have the deserved luxury to 'market' their well-defined skills under established code of conducts (ethics, interest, and occupational behavior) formulated and regulated by the association of the professionals. It's stressed in literatures that profession might be something emanating from thought and applied knowledge (i.e. abstratified Knowledge), the work of professionals such as pharmacy also has a feel of mundane tasks but nevertheless differs completely from those seen in ordinary technical work as it centers around a phenomenon described as science, logic, value which in turn confers great prestige, sense of autonomy and power to professionals (Causer and Exworthy, 1998; Petrakaki et al., 2011).

The work prestige of professionals (as in case of pharmacists) lies in the in fact that the trade they ply comes with high social status, regard and esteem conferred upon them by the society which arises from the nature of their work (higher social function and significant importance to the society) (Tinsley et al., 2003). Autonomy reflects in the ability of professionals to exhibit significant degree of control of their own affairs as they are independent and have freedom to exercise professional judgement which oftentimes can be subjected to critical evaluation by other members of the profession without marginalizing their self-interest (Hoogland et al., 2000). As explained Petrakaki and colleagues, autonomy confers power and authority to professional which can be rationalized from their tendency to make independent decisions based on internalized norms and expert knowledge, influence policy and decide on their remuneration— which oftentimes require the support of the state government as the case may be (Abbot, 1998; Benson and Cribb, 2009; Petrakaki et al., 2011). However, the power of individual and group of professionals can be marginalized as well. For example, pharmacists in institutional settings such hospitals, clinics are influenced by specific standards, code of ethics and behavioral norms drawn from their profession but also, to degrees, from their employing organizations (Edmund and Calnan, 2001). It was

stressed further in the consulted literature, professionals' power can be further limited by clients' ability to organize themselves into powerful groups that set requirements, pursue their rights and demand certain types of service (Petrakaki et al., 2011).

1.3.2 Redefining Professionalism through ICT

The advent and introduction of Information and Communication technology (ICT) not only change how people interact but also marked a new beginning in how various organizational and institutional functions/duties are defined and specifically carried out. For example, many industries have embraced computer technology because of the benefits of automated information processing which facilitate consistent and accurate conduction of routine, repetitive and monotonous tasks. Information and communication technology spanned a new way of generating, processing (e.g. statistically treated and compared), storing and retrieving data across platforms (temporal and spatial boundaries) while maintaining the parallel centralization and decentralization of data (whose integrity is not breached) and information as it renders it available to anyone, anywhere and hence generating in that way new types of information having new uses and users (Bloomfield et al., 1992;Doolin, 2005; Petrakaki et al., 2011). In as much as ICT improves work practice by making some tasks easier and faster through the use of computerized system and network, it also leads to the effective monitoring of work practice as transparency and legibility of work can be achieved which somehow left professionals exposed. In the words of Petrakaki and associate, the transparency that ICT provides enables constant surveillance and control, which in turn may influence reward structures and hence the ways in which professionals do their work. Legibility on the other hand is reflected in how it renders their activities visible as output (e.g. work history) which in turn assists the manager and hence the corporate body in decision making (Petrakaki et

al., 2011). Healthcare professionals are already using IT systems to support their daily work and, when considering the IT requirements for emerging working practices, pharmacists should consider what functions could be provided by systems that they already use. For example, the use of pharmacy management systems for medication records, dispensing, labelling, ordering and stock control. The use of ICT in the work practice of pharmacists enables the storage of structured patient records, facilitate the electronic prescribing, dispensing and administration of medicines, automate the handling of medicines in the supply chain and provide tools for monitoring the efficacy and safety of medicines in use (Goundrey-Smith, 2014)

1.3.3 Pharmacists as Vital Professionals in the Healthcare System

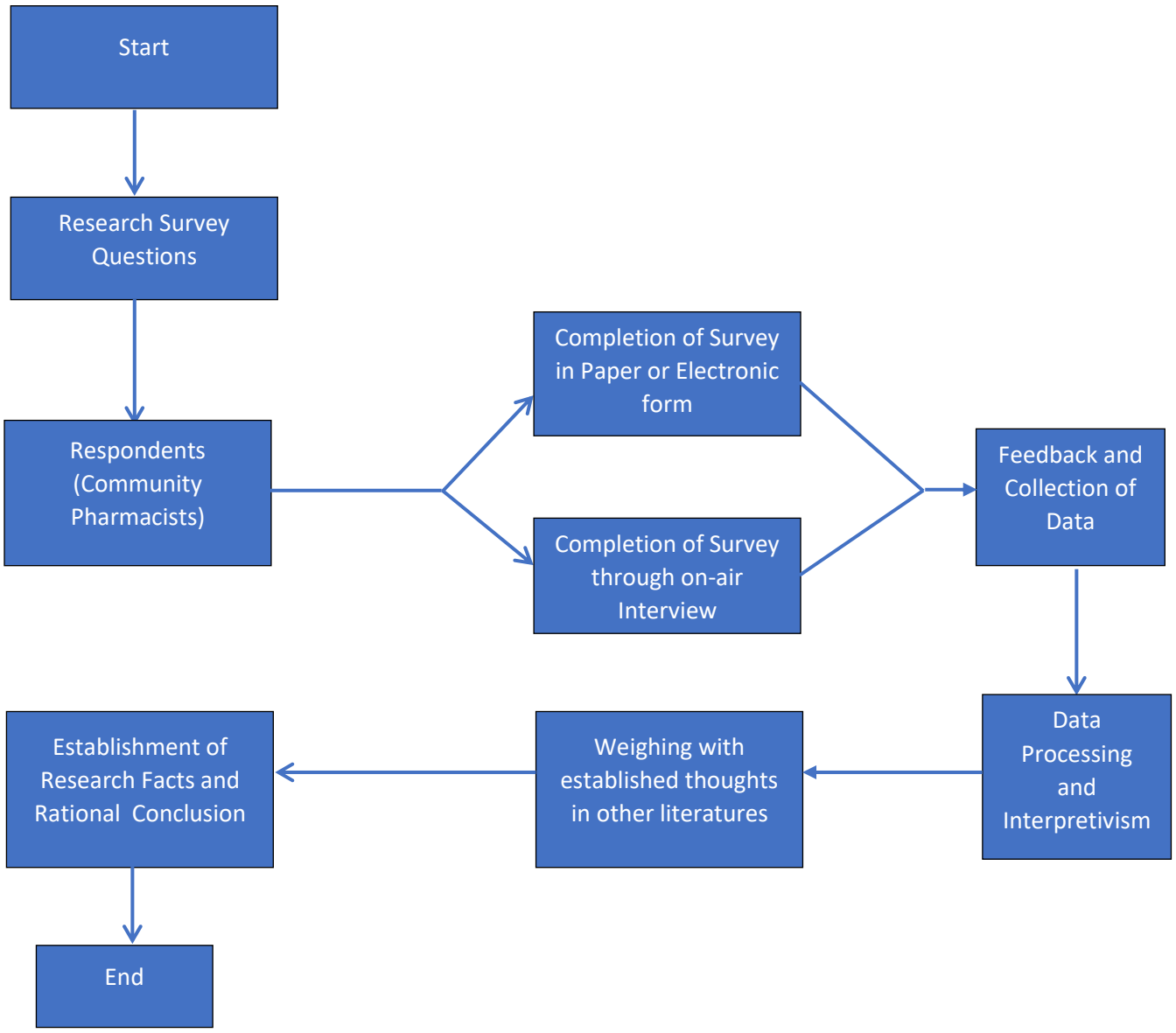
The role of pharmacists in the health system can be traced to the earliest time when the skills and expertise began with combination of the right ingredients in order to compound medicine that elicit physiological response in the body of patients (Adamcik et al., 1986; Edmund and Calnan, 2001). In stark contrast to other professionals such as oncologist, dermatologist, dentist, neurosurgeons among others, pharmacists do not specialize in specific part of the body and hence do not directly intervene in the body but rather centers on: (1) managing medicines in a safe and reliable way; and (2) treating patients as an individual with particular needs, values, culture and beliefs (Barber et al., 2005; Benson et al., 2009). Although the traditional pharmacists of old specializes in series of activities which cover combination of chemical components such as drugs (compounding), prescription, and supply of medications all of which can be ascribed to taught and applied knowledge on what they will do in the body. These all but distinguish them from other health professionals who are involved with medicine. However, the onslaught of industrialization and increasing regulation of medicines has led to concurrent reduction of medicine risks and

automated production of many medicines and new drugs with corresponding side effect and as a consequence, has affected the perception of pharmacists in the health system (Edmund and Calnan, 2001; Barber et al., 2005; Bush et al., 2009). This is because the 'industrialized production of drugs' has become the new norm thereby limiting the involvement of pharmacists by reducing their activities to labelling, record keeping, and drug dispensing. However, in recent years owing to reconsideration given to the profession based on its importance to the healthcare system, pharmacists' role has transformed as mere practitioner of 'product-focused' profession into a more clinical profession with new responsibilities for the management of prescriptions, common ailments and long term illness as well as provision of medical advices on healthy lifestyles (Adamcik et al., 1986; Benson et al., 2009). Hence, pharmacists or put as community pharmacists of the current age are becoming crucial than ever. This is because they are characterized by strong 'social presence' as they are more closer to the general public, acting as the link that bridge the gap between patients and specialists while also maintaining and improving the future viability of their businesses (as in the case of community pharmacists) without nullifying the scientific, and rational thinking and acting model that draws largely upon the law and their own codes, rules, standard operating procedures and policy guidelines (Timmermans and Berg, 2003; Benson et al., 2009)

1.4 Conceptual Framework

The present work is modeled on the overt use and application of qualitative questions archetype in gathering research data. The research data will be gathered either through the completion of questions in the survey in paper form or through the use of on-air interview (telephone call) based

on the respondent's convenience. All research feedback and data will be subjected to interpretivism. Below is the research conceptual framework.



CHAPTER TWO

LITERATURE REVIEW

2.1 Pharmacy— A Historic Profession

Pharmacy as a discipline is as old as human civilization. The practice is traceable to the medieval age (around 50,000 B.C) when early man used some plant materials having therapeutic properties for medicinal purposes (Subhashis, 2017). Traditionally, pharmacy was regarded as a transitional discipline between the health and chemical sciences and as a profession charged with ensuring the safe use of medication. In the early 1900s, pharmacists fulfilled the role of apothecary —preparing drug products solely for medicinal use (Pearson, 2007). Pharmaceutical drug preparation is a historic process traceable to the era of Babylonia Circa (2600 BC) and natable compounds used for drug preparation during this era include of honey, wine, beer, mineral compounds (e.g. common salt, iron, lead, bitumen, magnesia etc.) as well as powdered precious stones such as emeralds (Subhashis, 2017). Pharmacists and pharmaceutical preparations can be traced back to some influential nations in the medieval age such as Egypt, Greece, India, China as well as some countries in the Great Britain. For instance, Among the best-known early pharmacists include Diocles of Carystus, and Galen (a Greek physician and surgeon) while medicinal documents including Kahun Papyrus, writings of Hippocrates and the Chinese “Great Herbal manuscript” all of which are therapeutic based are well explained in literatures (Subhashis, 2017).

Historically, terms such as chemist and druggist were first to describe both chemical and drug merchants as well as emerging professionals of pharmacy who had passed its minor examination and thus meeting the minimum requirement to register as a pharmacist in the pharmaceutical society of Great Britain (Subhashis, 2017). Over time, a more distinguishable term "pharmaceutical chemist" was coined by advocates of French school of chemical based therapeutics, to be used in describing these health professionals broadly called chemist/druggist. Pharmaceutical chemist was therefore used aptly to describe those interested in organic chemistry and in the skilled compounding of all drug prescriptions (Subhashis, 2017). Interestingly the Rx symbol which historically symbolizes good health (in Egyptian mythology) has become a popular symbol in pharmaceutical practices of today is it represents prescription for drugs and medicines with specific properties and intended use (Subhashis, 2017).

Furthermore, retail pharmacy stores from which drugs and medication can be procured started popping up in the United States around 1729 with the first of the many being founded in Philadelphia by Irish immigrant Christopher Marshall (Subhashis, 2017). Although the roles of pharmacists around these times and up till the 1930s centered around pharmaceutical products, pharmacy as profession evolved greatly from mere functions of compounding, labelling and dispensing of products towards a focus on patient-oriented services which led to the development of concepts such as pharmaceutical care and clinical pharmacy as professional functions of pharmacists become diversified in the modern era (Adamcik et al., 1986; Pearson, 2007). Consequently, as pharmacists of today focus on provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life, pharmacy as a profession has been earmarked as one of best in the healthcare system with the prospect of increased growth and relevance in the society as professionals in this field are more closer to the general public rendering

various services not limited to filling of millions of drug prescriptions that are continually received year-on-year (Hepler and Strand, 1986; Pearson, 2007).

2.2 Pharmaceutical Care Services

Owing to extensive researches, professional development and abstractification of knowledge in continuum, a marked change has occurred in the profession of pharmacy from the traditional and primary focus on pharmaceutical products (drugs) to more attention on patients' drug therapy (Sreelalitha et al., 2012; Almarsdóttir et al., 2019). Hence, the scope of pharmacy has broadened in recent years as the concept of pharmaceutical care have been introduced into the system. The concept of pharmaceutical care proposes an entire shift from the traditional product–centric perception of merchandizing in pharmacy practice to a patient care-centered practice (Hepler and Strand, 1986). Consequently, modern pharmacists are required to build professional rapport with other health care professionals so as to collate, evaluate, and review health information as well as promote free flow of information on health-related matters across board that would improve patients' results (Sreelalitha et al., 2012).

Several definitions have been posited to capture and project the concept of pharmaceutical care in the healthcare system to a greater extent. For instance, the definition by thematic scholars Doug Hepler and Linda Strand given as "The responsible provision of drug therapy for the purpose of achieving outcomes that improve the patients' quality of life" aptly projected the principle of pharmaceutical care to the world (Hepler and Strand, 1990). This definition given by Hepler and Strand not only led to increased attention given to pharmaceutical care as an important concept in

the healthcare system, it would serve as basis for other definitions given by other researchers as well as various corporate bodies in explaining pharmaceutical care practice. Take for example, a Minnesota-based group defined pharmaceutical care as "A practice in which the practitioner takes the responsibility for a patient's drug-related needs and is held accountable for this commitment, and in the course of this practice, responsible drug therapy is provided for the purpose of achieving positive patient outcomes (Cipolle et al., 1998). In similar vein, the corporate body Pharmaceutical Care Network Europe (PCNE) defined pharmaceutical care as the pharmacologists/pharmacists' contribution to the care of individuals in order to optimize medicine use and improve health outcomes (Godman et al., 2014; Sreelalitha et al., 2012). The various definitions used in capturing and projecting pharmaceutical care practice established that the concept is not just about the drug and therapy alone, but also include the professional novel role pharmacists play in offsetting morbidity in patients under established ethical code which reflect in positive clinical outcomes and realistic economic expenditure (van Mil and Schulz, 2006). Thus, the perception of pharmacists in the healthcare has changed greatly as pharmacists have become the essential professional healthcare provider that patients turn to as trusted, highly accessible and resourceful healthcare personnel in relative to provision of health information, advice regarding the safe, appropriate and cost-effective use of drugs and medicines (Sreelalitha et al., 2012).

Furthermore, of the several problems faced by the healthcare system in providing quality health care to patients is the increased risk of medication error among host of other drug related problems which might arise from patients' lack of sufficient knowledge/information about their diseases or the drugs used in the disease prophylaxis. Through the concept of pharmaceutical care, problems such as those arising from medication error and other drug-related problems are effectively dealt with the aim of optimizing patients' health related quality of life (HRQOL) (Ernst

& Grizzle, 2001; Sreelalitha et al., 2012). Cipolle and Colleagues posited four key constructs which pharmaceutical care practice revolves around. The constructs reflect in (1) The social need to reduce drug-related morbidity and mortality associated with medication use; (2) Identification, resolving and prevention of drug therapy-related problem by responsible practitioners (pharmacists) in meeting the social need; (3) Provision of patient-centric services— meaning that practitioners (pharmacists) work directly for the sake of patient; and (4) Caring for the patients through constant assessment, designation of care plan and follow up.

2.3 Guidelines for Pharmaceutical Care

The American Public Health Association (APHA) highlighted that the goal of pharmaceutical care is to optimize the patient's health-related quality of life, and achieve positive clinical outcomes, within realistic economic expenditures. In order for this feasible, the cooperate organization highlighted key principles which should be followed by pharmacists when rendering pharmaceutical care to patients. These are discussed under the following headings[1].

A. Establishment and Maintenance of Professional Relationship

A mutual professional relationship modelled on trust, open communication, and cooperation is recommended by the American Public Health Association (APHA) to exist between pharmacist, patient and other healthcare provider. Such professional relationship should be capable of facilitating interaction which would enable sound decision making by pharmacists as regard the patient's and hence enhance the level of pharmaceutical care provided to the patient. In this bilaterally looking relationship, the role of patient is reduced to consenting to provision of personal information and preferences, and participate in the therapeutic plan designed by the pharmacists

while the pharmacist prioritize the patient's welfare, maintain an appropriate attitude of caring for the patient's health, and extensively use their professional knowledge and skills on the patient's behalf.

B. Collection, Processing and Maintenance of Patient-specific Medical Information

Health information assists pharmaceutical care giver in being conversant with the health status of patients and oftentimes facilitate sound decision making which revolves around the provided information. Thus, pharmacists providing pharmaceutical care are required to collect and/or generate subjective and objective information regarding the patient's general health and activity status, present illness/medication history as well as economic situation (financial and insurance status) to mention a few. Notable patient health information source to pharmacists as suggested by American Public Health Association includes personal information given by patients, medical charts and reports (such as those made available by the patient's family or caregiver, insurer, physicians, nurses, mid-level practitioners and other pharmacists) as well as self-generated information by pharmacists on patients.

C. Mutual Evaluation of Patient-specific Information and Development of Drug therapy with patient

Provision of pharmaceutical care entails the development of outcome-oriented drug therapy plan based on the expertise of pharmacist and physician and the consent of the patient. This would be based upon a thorough understanding of the patient and his/her condition or disease and its treatment. In designing the plan, the American public health Associated recommended that pharmacist must carefully consider the psycho-social aspects of the disease as well as the potential

relationship between the cost and/or complexity of therapy and patient adherence. It is also the duty of the pharmacists to let the patients be aware of various factors including cost, side effect, as well as monitoring aspects of the drug therapy plan. Furthermore, under the premise where one option may be more beneficial based on the pharmacist's professional judgment, such should be effectively communicated. Information should be provided to the patient at a level the patient will understand and an effective and timely documentation should be done such that patient's pharmacy records are always available for communication to other healthcare provider associated with the patients.

D. Professional Assurance to Patient on Vital Supplies and Information

In the provision of patient-centric services to patient, pharmacists should demonstrate a great level of professionalism. Hence, it is the duty of the pharmacists providing pharmaceutical care to patients to assume ultimate responsibility for assuring that his/her patient has been able to obtain, and is appropriately using, any drugs and related products or equipment called for in the drug therapy plan. In this case the resourcefulness of pharmacists is required to thoroughly assure patient of deep understanding of the ailment or disease and the therapy/medications prescribed in the plan.

E. Periodic and Timely Review/Modification of therapeutic plan

The pharmacist is responsible for monitoring the patient's progress in achieving the specific outcomes according to strategy developed in the drug therapy plan. In this case the pharmacist can initiate and coordinates changes in the plan with the patient and the patient's other healthcare providers as necessary and appropriate in order to maintain or enhance the safety and/or effectiveness of drug therapy and to help minimize overall healthcare costs. Based on treatment

follow up, the pharmacist rationalizes patients' improvement/progress and such is accurately documented in the pharmacy record and communicated to the patient as well as to the patient's other healthcare providers as appropriate. The pharmacist shares information with other healthcare providers as the setting for care changes thus helping assure continuity of care as the patient moves between the community setting, the institutional setting, and the long-term care setting.

2.4 Community Pharmacy

In an era of rapid change in health care delivery, pharmacy as a profession is experiencing significant growth and development irrespective of how pharmacists are often viewed with considerable ambiguity and uncertainty by those outside of the profession. The practice of community pharmacy we know today is the offshoot of a long arduous and dynamic path, constantly evolving from the then traditional practice of old. In the past, community pharmacy was known mainly for drug labelling, dispensing, compounding of medicines, over the counter prescription within the pharmacy facility set up (Quadagno, 2004; McPherson, 2011). Owing to the fact that the healthcare sector is a fluid niche characterized with continuous albeit changing demand in the type, quality and cost of healthcare services sought by the patients, attention is continually shifting to great emphasis on rendering on positive patient outcomes. Positive patients' outcomes are a function of several parameters that is not limited to the novel treatments received from physicians but also accessibility to valuable health information of which patients cannot oftentimes get from their physicians (Du Pasquier and Aslani, 2008; Melton and Lai, 2017). Some of these information does not only enable the continuity of quality healthcare services to patients who need care but also facilitate easy movement of patients within the healthcare system when

advanced/specialized health services are needed (Health Canada, 2012). The practice of community pharmacy which provides some of these basic services continue to deservedly gain noteworthy attention as integral and consistent part of the healthcare system in both the developed and developing world. Thus, Community pharmacy is the practice which involves counselling of patients, supplying/dispensing of medicines in accordance with prescription, provision of drug information to health professionals and maintaining the link with other professionals in the healthcare system (WHO, 1993).

The facility of community pharmacy has been earmarked as the most easily and most accessible to the general public and in the last two decades the role of community pharmacists within the healthcare system is on the rise as it reduces the cost of rendering primary healthcare and enhance patients' health quality. Moreover, community pharmacists constitute the largest subgroup within the overall pharmacy profession which include hospital pharmacists who provide clinical advice to hospitals and healthcare professionals, and those who work in pharmaceutical research (Petrakaki et al., 2011). The role community pharmacists play in the health sector and the society at large is well revered in the developed world. For instance, in Australia, community pharmacists are considered as a health practitioner and educator for the public while in the United States, community pharmacists are considered as a readily accessible primary healthcare provider (Chan et al., 2008; Abramowitz, 2009; Maher et al., 2014; Hashimi et al., 2017). Contrary to the significant attention and responsibility shouldered by community pharmacists within the health sector of the developed world, the practice of community pharmacy in the developing countries is totally different and as always the case community pharmacists role are typically confined to traditional practice of dispensing pharmaceutical drugs with a business-oriented approach being followed (Sreelalitha et al., 2012).To some extent, they are not considered as healthcare

professionals and hence their role is not overtly identified or recognized in the healthcare system (Azhar and Hassali, 2009)

2.5 Role of Community Pharmacists

In recent years, the roles of community pharmacists have changed in the health system as their professional functions have gone beyond product- oriented functions (drug compounding, labelling, dispensing etc.) to an increasing focus on individual patient and the public at large[2]. The World Health Organization identifies the major roles which can be ascribed to community pharmacists plying their trade as important healthcare professionals with the interest of the public health at the center of their activities. These are discussed under the following sub-sections

2.5.1 Processing of Prescription, Care of Patients and Clinical Pharmacy

As community pharmacists are one of the most accessible to patients, the receipt and processing of patient's drug prescription lies with these health professionals as their role in the health sector encompasses the verification of the legality, safety and appropriateness of the prescription order. As community pharmacists are mostly aware of patient's drug history, they are expected to provide patient-centric services to patients, provide essential advice to physicians when prescription is being filed and ensure that the quantity of medication are rightly and accurately dispensed. Community pharmacists' role in the health sector also include clarifying the patient's understanding of the intended dosage regimen and method of administration, advise on drug-related precaution as well as monitoring and evaluating therapeutic response in patients (WHO, 1993)

2.5.2 Extemporaneous Preparation and Responding to Symptoms of Minor Ailment

Extemporaneous compounding is the preparation of a therapeutic product or drug for an individual patient in response to an identified need (Subhashis, 2017). This practice represents a practical way to have medicines supplied when there is no other option. For instance, extemporaneous compounding may be useful for patients with dysphagia who are unable to swallow solid medications wholly, when an appropriate dose or dosage form is not commercially available, when patients require an individualized dose, or when medicines must be delivered via nasogastric or gastrostomy tubes (Burridge and Symons, 2015). Along with the provision of alternative health services such as supply local herbal drugs and homeopathic prescriptions, community pharmacists also perform the function of extemporaneous compounding under good manufacturing practices (WHO, 1993; Falconer and Steadman, 2017). Furthermore, community pharmacists enjoy significant closeness with patients and hence can manage minor ailments through provision of expert advice and supply of non-prescription medicine to patients with with the idea of referring to patients persisting symptoms to a medical practitioner when the need arises.

2.5.3 Health Promotions and Domiciliary Services

Community Pharmacists can take part in health promotion campaign at the local and national level on a wide range of health and drug use related topics. Their role towards the general public include but not limited to compiling and maintaining information on all medicines especially the newly introduced ones. They also complement the work of other healthcare professionals as well as enhancing the safety of patients by using the available information to promote rational use of drugs as well as provision of vital health information to physicians and the

general public. As part of the domiciliary health services rendered by community pharmacists, they oftentimes embark on advisory and in-house product delivery services to residential homes for the elderly and long-term patients as well as health counselling of patients who are too stricken to visit pharmacy.

2.6 Nigerian Health System and the profession of Pharmacy

Health system is the way people, resources and organizations that deliver healthcare services are structured and organized to meet the needs of the targeted population. Consistent communication and smooth flow of information, funds, qualified health practitioners to mention a few characterizes an effective health system which is structured for the primary and sole aim of improving health (Health Journal). The Health system in Nigeria is organized and structured on three tiers of government including Federal, state and Local government all of which are involved in the formulation and implementation of health policies. The federal government is responsible for making health policies, planning and initiating technical support to the general health system. This tier of government provides healthcare services to the citizen through the establishment of psychiatric, orthopedic and teaching hospitals and extensively monitor and coordinate the level at which the second tier of government (the state) implement the national health policies (Somoye, 2015). The activity of the federal government in the Nigeria health system also covers monitoring and control of diseases, providing and regulating drugs (including vaccines) and training healthcare experts (Somoye, 2015). The management of various general hospitals as well as technical aid and support for the primary healthcare facilities is usually presided over by the state tier government which is made up of state ministries and state hospitals management board (Abdulrahman et al., 2012).

At the third tier of the government in which primary healthcare services are discharged across all 774 local governments through various wards, the local government presides over the provision of basic health services, conduction of monthly sanitation and also monitors the health hygiene of the communities (Abimbola et al., 2014). Just as in the some of the health systems in the advanced world, primary healthcare service— a method of providing healthcare to community members at total participation and affordable cost— is the first point of contact for citizens who need treatment and counselling. Hence, health services rendered to patients at this level includes educative and counselling sessions aimed at identifying and controlling health challenges, organization of health promotional programs as well as provision of drugs and vaccines to mention a few. Pharmacists in Nigeria plays crucial role in these practices as little or no intervention of specialists is usually required in ensuring that affordable health services which enable patients to be self-determined, self-sustained and self-reliant are discharged (Somoye, 2015). This accounts for the presence of significant number of pharmacists in the primary health facilities in the country. On the premise that a case that cannot be managed by the primary healthcare facility exist, patients are usually referred to specialists who work hand in hand with pharmacists in ensuring that patients' health issues are addressed and solved (Somoye, 2015). Owing to the large population of Nigerian and oftentimes the inability of the government to provide adequate health services to the masses, private health facilities provide health services to the patients at corresponding prices while most of the major drugs/medicines needed by patients are usually purchased in various community pharmacy outlets (Scott-Emuakpor, 2010).

2.6.1 Role of Pharmacists in Nigeria Health System

In stark contrast to what is observed today, pharmacy as a profession did not start in Nigeria as a well-defined health care area of specialization as it is today. It emanated from the necessity to provide assistance to expatriate medical officers during the colonial era (Erah, 2003). The first pharmaceutical store in Nigeria can be ascribed to Dr. R Zacchaeus Bailey who opened a pharmacy shop for Europeans in Lagos in 1887 in which people were concurrently trained to handle drugs as drug dispensers, sanitary officers, medical aids and anaesthetists in operating theatres (Erah, 2002). The practice of pharmacy evolved greatly in Nigeria during this period as there was increased need to import drugs on large scale and redistribute on a wholesale basis. Since post-colonial days, advancements have been made in the practice of pharmacy in Nigeria as todays professional pharmacist standpoint in the health system have changed markedly thanks to increased level of education and legislation requirements (Erah, 2003).

The introduction and acceptance of clinical pharmacy into the practice of pharmacy in Nigeria in the 1980s led some hospital pharmacists to be involved in clinical activities including drug information service and unit dose dispensing. However, unlike many developed countries, the involvement of pharmacists in Nigeria in the application of the emerging roles has not been impressive. Although pharmaceutical care has become a preferred mode of practice, most pharmacists in Nigeria still hardly offer significant patient-oriented services. According to Erah (2003), decades have lapsed, but patient-oriented pharmacy practice in Nigerian hospitals and community pharmacies has suffered greatly. Erah observed that this is as result of poor staffing, poor infrastructure, lack of willingness of the pharmacists to add new evolving roles to their duties, lack of proper coordination of activities, resistance of physicians, lack of proper training for pharmacists, failure of many hospital and community pharmacies to adopt the practice and lack of

self-confidence (Erah 2002; Erah, 2003). All these culminated in pharmacists not given the positional respect they deserved in the Nigerian health system.

In recent years, the concept of pharmaceutical care has gained attention among health professionals and it is becoming an acceptable practice to Nigerian pharmacists. Even more so, the need for its application is frequently addressed in continuing education programs, conferences and workshops. However, not much has been done by the pharmacy profession to route the practice firmly to avoid neglect and intimidation arising from lack of understanding of purpose and misguided judgment by some other health care professional. The new roles for pharmacists in hospitals and community pharmacies in the provision of pharmaceutical care means that pharmacy profession must begin to address the need for the training of more technicians to assist in dispensing functions - if pharmacists will have the time to effectively provide pharmaceutical care.

2.6.2 Community Pharmacy Practice in Nigeria

Nigeria has one of the largest economies in the world and owing to this fact, it continues to witness the influx of various individual and cooperate owned organizations and business set ups across the 36 states of the federation. The practice of community pharmacy in Nigeria is not a new concept as the first pharmaceutical store was opened in Lagos state during the colonial era of the country. Contemporaneously, community pharmacy stores are well spread everywhere in Nigeria especially in the town and cities. Most graduates of pharmacy consider working here for some time or even starting one right way although the professional pharmacists' legislation in Nigeria stipulate that a pharmacy can only use one license for one career except if one decides to change career. Hence most community pharmacy in Nigeria are owned by licensed pharmacists although

non pharmacists have devised a mean to own and operate one with the help of a practicing pharmacist with a valid license. In the advanced world community pharmacy practice is less of a business operation, reverse is the case in Nigeria as most community pharmacy in the country are owned and operated by individuals of which majority are licensed individual pharmacists. Nevertheless, the practice of community pharmacy is of significant benefit to Nigeria (one of the most populous countries in the world) as the citizens (majority not covered by health insurance) see most of these street-level stores and their licensed operators as viable health consultants that are easily accessible to at low cost. Although most community pharmacy in Nigeria are operated with great focus on business operations, their activity are dual in nature as they usually do their best to compliment the work of hospital and clinical pharmacy even if no real collaborative relationship exist between them. This is usually done through stocking and selling of all forms of legal drugs from prescription-only medicine (POM), over the counter (OTC) drugs to prescription-only medicine-controlled drugs (POMCD).

The practice of community pharmacy is regulated by pharmacist council of Nigeria (PCN) who oversees the registration of pharmacists who are up to date with the Mandatory Continuing Professional Development (MCPD) program. The Pharmacists Council of Nigeria is a statutory organ of the federal government of Nigeria set up pursuant to decree 91 of 1992 under the flagship of federal ministry of health for the purpose of the regulation and control of practice of pharmacy, determining professional standards in pharmacy and securing the establishment and maintenance of registers of pharmacies. The Mandatory Continuing Professional Development (MCPD) is designed to update the knowledge of pharmacists, and enable them keep abreast of advancements in pharmaceutical development and modern trends in pharmacy. This is to enhance their skills in the process of providing pharmaceutical care[3]. Hence all community pharmacists are duly

registered with Pharmacists Council of Nigeria as Pharmaceutical chemists. As registered pharmaceutical chemists, community pharmacists in Nigeria are legalized to receive prescription from patients, procure and market safe drugs, counsel patients and manage minor ailments as well as well market alternative local medicines (herbal based products) verified by NAFDAC. In addition, another professional body called Association of Community Pharmacists of Nigeria (ACPN) function to promote the interest Community Pharmacy Practice in an enviable position in the health delivery system in Nigeria.

2.7 Community Pharmacy and ICT

Information and Communication technology has caused a great paradigm shift in all work stations as it allows some organizational processes to be automated. ICTs have had great impact in the professional set up of pharmacists and other healthcare providers as it has managed to reform, restructure and modernize the healthcare system. Over the years, preventable adverse drug events such as medication errors are a leading cause of harm to patients which have be of notable challenges to community pharmacies and hence community pharmacists are seeking technological solutions to keep up with new market demands and reduce the risk of errors (Aspden et al., 2007; Jawla and Rai, 2018). It has been explained across research literatures that improvements in medication error rates, staff efficiency and utilization, inventory control, customer service, and cost may all be afforded through the use of ICT in the professional set up of pharmacists (Benrimoj.and Robert, 2005; Forrester et al., 2014). Contemporaneous practice of community pharmacy has call for provision of patient oriented services in which ICT-based techniques use and application is becoming increasingly popular and hence most community pharmacists have no choice incorporate these modern technologies into their daily practice before they lose trend with

current practices (WHO, 1993; Lupiáñez-Villanueva et al., 2014; Goundrey-Smith, 2014). Some of the ICT based techniques being used in the practice of community pharmacy are explored under the succeeding headings

2.7.1 Pharmacy Information Management System

The pharmacy management system is an ICT-based technology designed specifically for pharmacy departmental use, with functionality for the management of pharmacy management operations such as dispensing processes, medicine labelling, patient medication records, stock control to mention a few (Goundrey-Smith, 2013). Various terms including patient medication record (PMR) and pharmacy information system have been used to describe pharmacy information systems in healthcare organizations/retail pharmacies across countries such as United Kingdom and United States (Anderson, 2005; Goundrey-Smith, 2013). Of the several rationales behind the implementation of pharmacy information management system in the early years was to improve the department's financial and operational performance (Gouveia et al., 1984; Borggren, 1984). Other explanations have it that the idea behind the implementation of pharmacy information system centers around standardizing manual procedures and improving efficiency of pharmaceutical operations and as such early pharmacy management system offers services including patient profiles, order entry, ward stock lists, unit dose cart fill lists as well as pharmacokinetic calculations (Moore et al., 1984; Goundrey-Smith, 2013). Pharmacy information management is of great importance to pharmacists as one research literature explained that with the system, 95 % of medication orders were conditionally entered by pharmacy technicians, prior to being verified by a pharmacist as well as facilitating a way through which information from other hospital computer systems could be received (Goundrey-Smith, 2014). Furthermore, the

pharmacy system enabled a patient medication record to be kept, which is important for community pharmacists of today. This is because prior to computerized systems, they had no other access to a patient medication record (Goundrey-Smith, 2014). Furthermore, to community pharmacists, pharmacy information system comes with a lot of benefit such as tracking drug expiries, enabling drug interaction screening, serves as electronic pharmacy reference tools (medicines information), as well as acting as check lists for patient counselling (Goundrey-Smith, 2014)

2.7.2 Electronic Prescription Services (E—Rx)

Electronic prescription services (E—Rx) refer to the electronic generation, transmission and receipt of drug/medicine prescriptions from a prescribing authority (e.g. doctor and nurse) to a dispensing authority (e.g. community pharmacist). E—Rx has been envisioned as a project that will bring considerable benefits to pharmacists' work such as cost reduction, legible prescriptions, faster dispensing process, faster access to information and time savings (Petrakaki et al., 2011). For health professionals such as community pharmacists, electronic prescription (E—Rx) services have made the drug dispensing processes more efficient, and by maintaining and employing patient record systems, a patient-centric and quality pharmaceutical care services can be rendered by pharmacists which would reflect in accurate transmission of patient discharge prescription, as well as prevention of errors due to miscommunication of drug information (Petrakaki et al., 2011). The concept of electronic prescription of drugs/medicines was developed and implemented in the early 1990s in the United States and from that time onward, it has become a globalized practice as hospitals and pharmaceutical stores around the world continue to adopt the technological invention and have it included in their modus operandi as healthcare providers (Abramson et al., 2011; Johnson and Lehmann, 2013).

The idea behind the design, adoption and implementation of electronic prescription is to share patient's drug/medicine prescription electronically to the community pharmacist and thus bridge the gap between hospitals and pharmacists regarding patient safety. Electronic prescription is beneficial to patients especially those with chronic conditions that are on repeat prescriptions, collect their medicine in the same place (a self-nominated pharmacy) or find it hard to regularly visit the general medical practitioner[4.] Electronic prescription also benefits pharmacists as electronically sent prescription enables pharmacists to go paperless, reduce the amount of municipal waste generated and ensures timely and correct receipt of patients' choice of medicine and hence swift delivery.

2.7.3 Electronic Barcoding

Bar-coding is a popular technological invention that is well-established across industries outside of the healthcare sector. In complementary use with electronic prescription system, barcode identification of drugs and medicines is now being used within healthcare to enhance efficacy and safety of pharmaceutical drugs supplied to patients as well as drugs supplied on wholesale basis[5]. Counterfeit drugs containing the wrong medicaments or without active pharmaceutical ingredient (API) is a significant challenge to community pharmacist while dispensing the drugs to the patients. Thus electronic barcode scanning has been earmarked as a novel ICT technique which is helpful in decreasing medication errors through scanning of the bar codes of medicines at dispensing areas allowing patients to be supplied with exact medicine and as a consequence improving the completeness of the drug administration history of patients undergoing treatment (Hartman, 2004; Cohen et al., 2009; Jawla and Rai, 2018).

According to a consulted literature, about 75% of wrong drug or wrong dose errors are captured and corrected using barcode technology, and there is sufficient evidence that barcode scanning is becoming the standard of practice in pharmacies (ISMP, 2009). For example, the United states implemented the Falsified Medicines Directive (FMD) system (which entails using barcode scanner in dispensing area to detect and filter substitute or fake drugs) in the practice of community pharmacy so as to facilitate unique identification of drugs (Jawla and Rai, 2018). Various reasons have been overtly stated for implementing barcode scanning for product verification in the practice of community pharmacists. This include the desire to improve the accuracy and safety of the dispensing process, the ease with which the technology fit with pharmacy workflow, improvement of staff efficiency, inventory control, and a belief that the technology was necessary to stay in business (ISMP, 2009).

2.7.4 Health Information Technology (HIT)

Health information system is an ICT-based technique that facilitates the capture, storage, retrieval, dissemination and management of information about the health of the member of the public or organizations that work with the private and public health sector. A well-functioning health information system is used in effective collection, analysis and report of information about the health of people and mostly helps in making adequate health policies as well as help in understanding the financial requirements required for health research (Ezeonwu, 2013). In the advanced world, health information systems technology is used by health professionals to collect and store data including age, gender, and location, number of visitations to consultants, disease and medication history as well as level of recuperation from patients. The data collected and hence

stored in electronic data base assist professionals (Doctors, nurses, pharmacists) along with the patient in decision making.

The benefit of this computerized system of patient health history and documentation is that it does not rely on paperwork which could be damaged, lost or at times lead to more error and inefficiency. According to DeSalvo et al (2015) HIT ensure that necessary information is present at the place and time of care, improves health care quality, reduce medication errors to the barest, and the delivery of appropriate evidence-based medical care is assured by health professionals while securing and maintaining Individual patient identifiable health information. Despite its novelty, health information technology in the practice of community pharmacy is still not as popular as the other ICT based techniques in some part of the world. For instance, privacy problems arising from the pre-meditated decision of patients to give inaccurate information for fears of invading into their private lives still remain the major challenge in the use of health information technology

2.7.5 Telemedicine and Tele pharmacy

As defined in the research literature authored by David M. Angaran, telemedicine is "the use of information and communications technologies to provide and support health care when distance separates the participants (i.e. health professionals, patients and other stakeholders)" (Angaran, 1999). Telemedicine is usually facilitated by digital communication tools such as videoconferencing, telephones, computers, the Internet, fax, radio, and television which are used in providing health services to the public. Telepharmacy has the same basic definition but refers to pharmaceutical care provision. In the professional pharmacy practice setting, video-

conferencing for education, training, and management purposes are continually employed. In recent years, mobile phones have changed from a dial-and-talk instrument to a multimedia access tool and as such pharmacists have come up with the idea to run both organizational and individual practitioner web sites, performing various functions such as marketing of drugs and medicines to patients through online drugstores — a development that are attracting most attention in the current age. Furthermore, medical devices are now being attached to telephone lines to provide remote monitoring and therapy, and call centers are providing medication counseling, prior authorization, refill authorization, and formulary compliance monitoring (Angaran, 1999).

Telepharmacy is of great benefits to pharmacists as pharmaceutical care provider. For instance, telemedicine/telepharmacy supports personalized medicine and hence can be seen as a tool for rendering patient centric services (Jawla and Rai, 2018). It also enhances health care access to by cutting down the need for regular attendance at the hospital as regards people with poor mobility, or in remote areas. The predicted potential benefits of telemedicine including improved access to care, greater efficiency in diagnosis and treatment, higher productivity, and market positioning for drugs as explained one research literature are even manifesting in the presently (Angaran, 1999).

2.8. Community Pharmacy and ICT—A Literature Appraisal on Impact, Challenges and Benefits of ICTs.

Community pharmacies, the practice itself and the professionals in the field face new challenges every day. Pharmacists are increasingly asked to optimize complex medication regimens and provide innovative patient care services while responding to demands for increased

efficiency (ISMP, 2009). These challenges are pronounced in empirical observations including operational pressures such as increasing prescription volumes, workforce shortages, and shrinking third-party reimbursements which are taking a toll on the pharmacist's ability to work efficiently and safely. In the advanced world such as Australia, United kingdom and United States, community pharmacies and their professionals enjoys unrestricted access to patient related health care information like the medical history and profile of patients and laboratory values through centralized health data base made possible by information and communication technology (Millonig et al., 2002), This phenomenon accounts for the stance maintained and importance given to community pharmacy by the health sector and the general public of these advanced nations at large. Courtesy of this, their work as professionals is highly collaborative, efficient and of the highest quality. The same cannot be said of community pharmacists in the developing states like Nigeria. Of the key factors that can be ascribed to the level of success enjoyed by community pharmacists in these advanced countries include advanced education, technological development and advancements, cooperation and hence collaborations with other professionals in the health system as well as better legislative standard and government policies (Graabæk, et al., 2019). As with most developing countries, the practice of community pharmacy is below the standard thanks to various barriers which have become a stumbling block for the full practice of community pharmacy (e.g. absence of true pharmaceutical care due to enormous workload) and the health system at large (Hashimi et al., 2017). For instance, in the Lagos state metropolis where community pharmacy stores are well pronounced, professionals (community pharmacists) do not have access to patients' documents records as no information about patients/profiling neither exist on a central database nor clinical records of patients and drugs are stored for future reference. As a consequence, collaborative sharing of information between the clinicians and community

pharmacists is of course impossible and community pharmacists have no truly defined place in the Nigeria health system.

As the role of community pharmacists in the advanced world have morphed from ordinary drug compounding and dispensing to more patient-centric services which thus confers great prestige to community pharmacists in these countries, the same cannot be said of community pharmacists in a Nigeria. According to research literatures, the accessibility of community pharmacists to patients' record system usually assist pharmacists in professional decision-making to provide patient centric services as pharmacists are apparently closer to patients through this (van Lint, 2003; Groundrey-Smith, 2014). The fact that community pharmacists in Nigeria does not enjoy this make it more challenging to offer patient-centric services and as such oftentimes overshadow their decision making as professionals (Leung et al., 2013; Afolabi and Oyebisi, 2007). Consequently, little or no knowledge about patients' records, history with drug/medicine use based on health issues have continually led to various occurrence such as medication error, wrong prescription and poor dispensing of drugs which often leads to reduction in Patients' Quality of Life and even outright death at times. This supposed and limiting unprofessionalism is another of the herculean challenging issues faced by community pharmacists in Nigeria and as a consequence have affected how community pharmacists are perceived within the health system and in the eye of the general public (Afolabi and Oyebisi, 2017).

Furthermore, a stable and computerized ICT networked system have been earmarked and employed as novel tools in reshaping the practice of community pharmacists in the developed societies. For instance, electronic prescription which began in the 1990s in the united states have virtually become a generalized practice in professional functions of community pharmacists while other techniques such as barcode identification of falsified medicines, telemedicine among host of

others are also among the front running ICT techniques employed as a way of rendering patient centric services as well as easing the workload of community pharmacists as professionals. Such is not the case in the practice of community pharmacy in Nigeria as various research studies have established that the use of ICT techniques not only in the practice of community pharmacy but the health system at large is below par in few of the set ups they have been seen. For instance, in the research work of Idowu and colleagues on the impact of ICT indicators including simple mobile phones, personal computers and internet routers used by professionals in their line of duty. The researchers observed that simple mobile phones were only used to facilitate rendering of health services (perhaps telemedicine) while the use of internet over a linked server in the professional settings explored in the research study was nonexistent which all but reduces the quality of pharmaceutical and health care rendered to patients (Idowu et al., 2003). In relative to this, Omotosho and colleagues pointed that the process of managing written prescriptions and related telephone messages consumes substantial time for prescribers and their staff in Nigeria, and these processes are prone to errors and miscommunication, which sometimes results in patient harm (Omotosho et al., 2018). Also, in some other research studies it was also explained that electronic prescribing services (E-Rx) is an important approach to reducing medication errors, improving the quality of patient care, and creating healthcare savings (Woan et al., 2009). Omotosho et al reported that EPS's have the potential to greatly reduce adverse pharmaceutical effects caused by poor transcription, drug-drug interaction, allergies, dosage errors, and process inefficiencies. A claim statistically backed by the fact that significant improvements associated with EP implementation was achieved, including an 86% decrease in serious medication errors, and an increase in Medicare formulary adherence from 14% to 88% (Speaker and Audet, 2006). It was pointed that deaths arising from mistakes/misinformation could be proactively prevented through

E-Rx as prescribers would be able to correctly send the right patient's to pharmacists with no detail lost

It was also pointed in literatures that the fact that electronic prescription leads to better operational and professional performances as well as patients' safety does not translate to it being a widely adopted phenomenon as slow adoption have been observed also in some developed states (Omotosho et al., 2018). Crucial factors causing this were also highlighted in various works. For example, in some countries where slow adoption of electronic prescription has been observed, financial limitation and regulatory barriers have been observed to play crucial role. In the research studies such as the work of Ash and Bates (2005), many barriers including the misalignment of financial incentives, the high cost of purchase, implementation and maintenance of systems, the immaturity of software products and vendors, the lack of integration between Electronic Health Record (EHR) systems, as well as physician resistance were concisely reported to hinder the adoption of e-prescribing systems (EPS). Other factors such as state despotism, high cost of adoption and overpricing are some of the possible factors in the adoption of e-health practices (Morton and Wiedenbeck, 2010). Furthermore, and according to the U.S. Department of Health and Human Services, while most industries spent $8,000 per worker for Information and Communication Technologies (ICT) in the last decade, the healthcare industry invested only $1,000 per worker[6]. Educational advancements are also observed to play crucial role in the use of computerized network system in the practice of community pharmacy. Hence, parameters such as little knowledge and lack of awareness especially in the developing countries have been reported especially in the developing countries (Omotosho et al., 2018). These researchers rationalized that factors affecting the slow or non-adoption of electronic prescription in developed countries may differ from those in the developing world.

Similarly, Okoroafor and associates revealed that unavailability of digital tools, erratic power supply and poor communication networks are some of the grand challenges limiting the prospects of telemedicine and biomedical care practices in Nigeria (Okoroafor et al., 2017). Nevertheless, in countries where Electronic prescription is a popular practice, health professionals including community pharmacists sees the use of electronic prescription as a novel development as they believed and opined that an integrated E-Rx and drug management system would improve continuity of care, and they were more likely to use the system for patients with more complex, fragmented care. Perhaps in support of this observation, a group of Singapore-based researchers led by Woan surveyed nine national healthcare groups in Singapore to investigate satisfaction with EPS implemented in that country (Woan et al., 2009). According to these researchers, pharmacists, doctors and nurses showed high levels of satisfaction with electronic prescribing; doctors and pharmacists agreed that electronic prescription reduced prescribing errors and interventions, and as a consequence would rather not go back to the paper-based system of prescription (Woan et al., 2009). Similarly, in another research survey conducted by Shams, an observation was made on satisfaction on the use of electronic prescription and the researcher showed that overall satisfaction with integrated e-prescription was high among health professionals (Shams, 2011). It was reportedly observed that physicians, pharmacy staff and nurses surveyed, 'highly agreed' that their electronic prescription service reduced prescribing errors, and they did not want to go back to the paper-based prescription system and pharmacy staff and nurses viewed the electronic prescription more positively and were more satisfied with it than were physicians (Shams, 2011; Omotosho et al., 2011). Even more so, patients are seeing the idea of electronic prescription to be beneficial to them. Hence in the published research study of Went and Colleagues comparing EPS with paper prescription charts of 16 patients in intensive care to assess any change in the number of

prescribing errors. The overall level of compliance with nationally accepted standards was significantly higher with the EPS (92%) than with the paper system (47%). The researchers observed that fewer deviations from accepted standards were found in electronically generated prescriptions (28 of 329 prescriptions; 8.5%) compared to written prescriptions (208 of 408 prescriptions; 51%). They concluded that the reduction in prescribing errors with the electronic prescription was significant, and that involving clinicians in the design and development of an electronic prescription raised acceptance and adoption (Went et al., 2010). In Nigeria, the practice of community pharmacists is not as revered as those seen in the other world and despite the wide use of ICTs in other professional settings in the country, the use of computerized network and ICT based techniques such as electronic prescription in the professional duty of community pharmacists is still far from the acceptable standard seen in the developed world. Perhaps for developing countries such as Nigeria, the use of computerized system in community pharmacy is relatively remains at an immature stage and in those settings where it had been implemented it still remain to be ineffective. An insight to factors such as awareness, professional training, government policy and supports as well as reception by other stakeholders in the health system account for the success of electronic prescription services in the developed world. Based on these observations and appraised literatures, the present work study would delve into the practice of community pharmacy in a selected locality and investigates the impact information and communication technology which have reshaped the practice of community pharmacy plays or could play in the Nigerian community.

CHAPTER THREE

METHODOLOGY

3.1 Research Study Overview

The present work was modelled on qualitative research pedagogy and relied on the use of deductive survey questions. The research study was conducted specifically in the selected locality of Eti-Osa, EtI-Osa Local government area within the Lagos State metropolis, Nigeria. The qualitative pedagogy approach was aimed at drawing out patterns and insight from the practice of community pharmacy by exploring and rationalizing the use of ICT and ICT-based techniques including health information technology, electronic prescription and telecare in the said professional setting. This was facilitated through a conducted semi-structured interview that led to the generation of in-depth explanatory data obtained from a small sample of licensed and practicing community pharmacists (those in stand-alone stores) using the pre-drafted qualitative survey questions as research tool. Consequently, a rational conclusion on the use of these techniques which is based on the illustrative and explanatory opinions of the respondents that participated in the study was reached.

3.2 Research Study Setting and Population

Community Pharmacy practice is important to the healthcare system of Nigeria, and the practice and activities of its practitioners are regulated by Pharmacists Council of Nigeria (PCN)

and hence all practicing pharmacists as well as those operating community pharmacy stores are duly registered with the PCN regulatory body. As these pharmacists are professional whose work ethics, duties, and functions are in linear correspondence with the focus of the present research, they were thus chosen as the ideal research population for the present study.

Thus, the present work was conducted in a selected local government Area of Eti Osa LGA of Lagos State. Eti-Osa is an urban settlement with a population of 283,971 inhabitants (158,858 male and 124,933 female) which account for 31.11% of the total population of Lagos state [7]. It is regarded as Ikoyi-Obalende LCDA area, Eti-Osa East LCDA and Victoria Island LCDA by the Lagos State Government, and the area is renowned for its large commercial and administrative activities. Community pharmacy sector is well established in this chosen area of study as there are several independently owned pharmacy stores which are clustered and located across the region known for continuous commercial activities throughout the year.

3.3 Research Tool Design

The research study data were generated through deductive survey questions revolving around the focus of the research study. The qualitative research questionnaire hence called "research tool" in the present work was drafted in such a way that it has a feel of human element which is reflected in the open-endedness of its questions. Therefore, the research tool was designed and sectioned into two parts which facilitated the collection of the demographic data and opinions of the respondents respectively. The second part of the research tool contained ten (10) qualitative questions which were systematically drafted and sub-sectioned into 4 categories. These four categories contained the questions that were used collect data on Pharmacists' familiarity with ICT

technology usage in the practice of community pharmacy; Reception and adoption of ICT technology in the practice of community pharmacy; Training and implementation of ICT technology; and finally, the policy and barrier ascribed with ICT usage in the practice of community pharmacy. The categorization of the research tool questions was chosen so as ease the subsequent data analysis upon the collection and interpretation of research data gotten from respondents. In addition to this, flexibility was entertained in the present study and hence respondents were presented with the luxury to choose the form/method with which the survey is to be completed. Simply put, respondents were allowed to complete the survey in textual format (commenting on the question in written statement) or through on-air interview (involving the use of mobile phone call). Although both methods were aimed at making the participation of respondents to be convenient within the limited time frame, respondents preferred the latter method due to their working condition among host of other factors such as time convenience.

3.4 Sampling plan

In this present research study, purposive and snowballing sampling techniques were employed. Only registered and practicing community pharmacists in stand-alone stores in the study locality were used for the study, meaning that pharmacy technicians and other supporting staff were excluded from the study. Community pharmacists in these stand-alone stores in the selected locality of Eti-Osa LGA work from 8 am—10 pm every day, and the research sampling frame was made up of 15 community pharmacists in different stand-alone pharmacies in the selected locality of Eti-Osa LGA in the Lagos State Metropolis. The sampling “frame here” connotes the projected number of people or respondents who could possibly participate in the study.

3.5 Data Collection, Processing and Survey Ethics

Table 1:Research Data Collection Process Summary

S/N	Research Parameters	
1	Sampling Technique	Purposive and Snowballing method
2	Sampling Frame	15 respondents targeted; 7 were successfully engaged
3	Role of Engaged Respondents	4 Employee community pharmacists, 2 Superintendent pharmacists and 1 Director Pharmacists
4	Mode of Interview	Semi-structured interview conducted on air through mobile phone call
5	Duration of Interview	35.7 minutes (on average)

All pharmacists engaged were sourced from different standalone pharmacies in the present study location of Eti-Osa LGA, Lagos state Nigeria. The semi-structured interviews were conducted on air using mobile phone call and each session actually lasted for a period of 30—40minutes although 60 minutes was pre-selected as the maximum tolerable time with each community pharmacist. Through the semi-structured interviews, unstructured data (respondents' speech-based opinions) were generated and effectively collected. In order to maintain quality and protection of data generated in the use of mobile phone call interview, conversations were audiotaped based on agreed consent on what they would be subsequently used for. Notes were also taken during the

interview process so as to establish data quality and linear correspondence. Finally, the audiotaped respondents' opinions were transcribed into the corresponding textual format and updated with the some of the notes taken during the course of interview

3.6 Research Data Analysis

For the present study, the research data from the respondents were analyzed through Deductive Thematic Analysis approach. This qualitative method of data analysis follows six models which include (1) Reading through transcribed text and establishing data correspondence with the research focus; (2) "Coding" of texts to bring out the salient points and similar response pattern from respondents; (3) Using the coded texts to generate a themes; (4) Reviewing the generated themes so as to offset data anomaly and research bias; (5) Renaming the themes as the case may be; and (6) Writing up a theme to aptly capture and project a particular research observation.

CHAPTER FOUR

RESEARCH FINDINGS AND RESULTS

4.1 Research Data

In the present study, the extensive use of computerized network and ICT based techniques including Health Information Technology (HIT), Electronic Prescription (E-Rx) and Telemedicine were explored in the professional line of duty of community pharmacists (CPs) in Eti Osa Local Government Area, Lagos state metropolis in Nigeria. The sociodemographic data of community pharmacists engaged in this research study and characteristics of the research study location are summarized in the table below.

Table 2: Sociodemographic Information

Respondent Characteristics	**Sample size (n=7)**
	Frequency
• **Gender**	
Male	3
Female	4
• **Education Qualification**	
B. Pharm	6
M. Phil	1
Pharm. D	

• **Experience Level (Years)**	
1—5 5—10 >10	4 2 1
• **Role in the Pharmacy**	
Director Superintendent Pharmacists Employee	1 2 4
• **Research Study Area Characteristics**	
Location Population Dominant type of Community Pharmacy store Standard Operating Hours	Eti Osa Local Government 283,971 inhabitants Standalone Pharmacy 8 am—10pm

4.2 Formation of Themes

As contained in the methodology, seven community pharmacists were engaged and the interviews were audiotaped and whenever possible, notes were taken in the mid of conversation. Although a "theoretical theme" was predetermined for the research study, the audiotaped interviews were transcribed into texts and respondents' opinions were coded to identify the key

and similar response pattern from all respondents. Hence five (5) key themes were identified based on respondents' similar qualitative opinions and these are:

1. Community Pharmacists and ICTs— The Familiarity
2. Inexistence of HIT system and Non-usage of ICT
3. Changing professional stance of community pharmacists through ICT
4. Stakeholders and ICTs in community pharmacy—The Benefits
5. Community Pharmacy and ICTs— Implementation, Barriers and Suggestions

4.3 Thematic Discussion

The five key themes identified are discussed here. Under each thematic discussion, some of the transcribed quotes from respondents are used to support a particular theme being discussed. For the sake of clarity, respondents (community pharmacists) in the same role category are pooled together and coded. For instance, pharmacists who work as employee are coded as "Employee Community Pharmacist (ECP)" and they range from 1—4; pharmacists with superintendent designation are coded as "superintendent Community pharmacist (SCP)" and they range from 1—2; and the last respondent is coded "Director Community Pharmacist (DCP)".

4.3.1 Theme 1: Community Pharmacists and ICTs— The Familiarity

In all the conducted interviews, engaged community pharmacists (CPs) demonstrated familiarity with the use of computerized system and ICT-based techniques including Health Information Technology (HIT), Electronic Prescription, and Telecare usage in the professional setting of community pharmacists. Majority of the respondents (pharmacists) simply answered "…Yes, I am aware of these techniques…" when asked whether they know about electronic

prescription and telemedicine. When these practicing community pharmacists were pressed to elaborate on these ICT techniques, convincing response which solidified their awareness claim were obtained. Thus, in one of the respondents' opinions, it was observed that community pharmacists in the study location really understand the route, systematic mode of operation and the major parties involved in the use of electronic prescription. This is inferred from the response given by one community pharmacists as transcribed below.

ECP1 with 1—5 years of experience: *"…I am aware of electronic prescription service…it is a novel e-networked system which allowed a licensed and trained pharmacist to receive a particular patient's prescription electronically from a doctor/nurse or other health professional in charge of the patient's care…"*

A similar response pattern was observed with other respondents with some explaining as far as the ICT-based technique is something that enables community pharmacists to share "open professional rapport" with other health professionals especially those that majorly prescribe drugs/medicines for patients. In a similar manner, respondents were quizzed on the concept of telecare and how it relates to the practice of community pharmacy. And a handful of the respondent were able to aptly show great level of understanding while others were also convincing in their response. For instance, the succeeding quoted responses supported this observation

SCP2 with 5—10 years of experience: "*…in the case of telecare, it is another way for we pharmacists to render pharmaceutical services electronically to patients who might be or not necessarily be distanced from us as the case may be….so the use of these techniques in the community pharmacy practice is something that would enhance us professionally and which would benefit people we are attending to…."*

ECP4 with 1—5 years of experience "*...well what I can say about electronic prescription and telecare is that they are great technological inventions as one facilitate reciept of patients' drug medication prescription over computer server and router within short time in the case of electronic prescription use while the other somehow let us attend to patients on phone without the need for physical presence…."*

4.3.2 Theme 2: Inexistence of HIT system and Non-usage of ICT

All interviewed community pharmacists demonstrated familiarity with the use of computerized network and ICT based techniques in the professional duty of community pharmacists. However, as the interview proceed, it was found that their familiarity is based on theoretical knowledge gained perhaps gained through education or resourcefulness about the latest development around the world. Hence, when respondents were quizzed on actual usage on the use of ICT techniques such as how they usually gain access to their patients' health record, to what extent do they use electronic prescription and telecare in discharging pharmaceutical care. It was found that the use is inexistent. For instance, a pharmacist truthfully opened up that she has hasn't gain access to patients' health record on a computerized network before.

ECP3 with 1—5 years of experience: *"...In my years of working as a community pharmacist, I've not really access patient health record through computerize networked system...and no pharmacists I know have ever said or does something like that…"*

This truthful opinion from this respondent probably indicated she would lack the technical skills to do such, and based on her claim that no pharmacist she knows have ever done that, it is possible

that the situation is applicable to all community pharmacists in this study area. A response to even support this was provided by another pharmacists as follows:

SCP1 with 5—10 years of Experience*:* *"…The use of computerized system in our professional setting in this area is far from discussion. On a personal level, if I am to rate it without being biased, I would give it 1 on a scale of 10 and this is because I've managed to use something like computer system in the past before it was shut down but never used electronic prescription and didn't see it around here either…"*

SCP1 with 5—10 years of Experience: *"…on the issue of health information system, the closest to accessing patient record that I can say is in the case of some patients who are regular here that we collected their info through word of mouth and have them documented in the pharmacy's patient management record book…."*

Interestingly, an experienced pharmacist engaged gave a broad explanation which helped in concluding that no such thing actually exists in the system and hence majority if not all pharmacists here might lack the technical skill as well.

DCP with more than 10 years of Experience: *"…In this area, there's no such thing like patient electronic health information system here in community pharmacy and perhaps the whole federation at large…"you know this is not something that has do with us alone, it is a bilaterally looking phenomenon in which hospitals, clinics, other professional and likes contribute and collate their knowledge about patients into a unified data base which is thus made available with the consent of patients to all healthcare providers of which we pharmacists are among…and presently no such electronic database exit meaning we have nothing to access even if we want to…."*

As respondents' opinion concerning the use of these ICT-based techniques in the practice of community pharmacy all tailed to one end, it is an outright move to rationalize that the use of ICT techniques including patient health information technology and electronic prescription were lacking in the practice of community pharmacy in the present study location and perhaps the state at large given the level of urbanization in this area explored.

4.3.3 Theme 3: Changing professional stance of community pharmacists through ICT

Respondents were quizzed on the adoption of ICT-based techniques, the actual use of computerized system and ICTs would play in the professional setting of community pharmacy. Respondents see the introduction of these techniques into their professional circus on a positive note and from their response patterns, it is inferred ICT and ICT-based techniques would reshape their professional duties and would probably swing their work practice in a new direction— of course a good one. Accordingly, of the major respondents' opinions backing this observation include:

DCP with more than 10 years of Experience: *"…The introduction of computerized network system into the practice of community pharmacy in this locality would enable us to do what is expected of modern-day community pharmacist. Modern day community pharmacists here mean pharmacists who render patient-centric services when we collaborate with patients and hospital/clinical physicians and have full access to our patients record through a functional e-health system and thus are always aware of their patients' health condition…"*

SCP1 with 5—10 years of Experience: *"…That's a thoughtful idea given that people are going digital these days and so is various professional organization and community*

pharmacy shouldn't be operating outside of this trend given the importance of our service to the public…it would make our work more organized, legible and create a way for us to collaborate and relate effectively with other cogent health professionals and gain the respect and attention we truly deserve which have been lacking for some time now …"

From these opinions on the adoption of ICT-based techniques into the practice, it is observed that there is a kind of "professional relationship gap" between community pharmacists and other health professionals such as hospitals physicians when it comes to patients' health information and records and as consequence sees ICT and ICT-based techniques capable of bridging the "professional gap". Furthermore, respondents were convinced that such introduction would concurrently tackle issues such as those arising from medication errors, easing their workload and conserving time. One of the transcribed opinions which is chosen as representative of similar response patterns to support this goes thus:

SCP2 with 5—10 years of Experience: *"…Actually, the potential introduction of ICT techniques into our work setting is a nice idea; in fact, it would be a giant stride…despite that the current methods such as manual filling of drug prescriptions somehow befits the status of our contemporary society here, ICTs would mark a paradigm shift in our setting as our functions would be more diversely professionalized…."*

4.3.4 Theme 4: Stakeholders and ICTs in community pharmacy—The Benefits

Stakeholders corresponds to individuals and organizations who have interests in community pharmacy or have invested into the practice with various resources not limited to skills, time, financial packages among others. Hence, the major stakeholders identified in this study

includes community pharmacists, patients, other health professionals and various cooperate bodies such as PCN, ACPN and the health system at large. Throughout the sessions, respondents emphasized greatly on the importance and benefits that would come with the introduction and use of computerized systems and ICT techniques in the practice of community pharmacists. Hence another key theme was formed with center around these stakeholders' benefits.

ECP4 with 1—5 years of experience: *"…In as much as ICT usage have increased operational performances in various work setting in the world, I believe reverse won't be the case here and this is because it would ease our practice as pharmacist as our work will be streamlined and follow a steady course…For example, if I have a functional ICT system here at my disposal, I can achieve swift and effective stock control and balance the book without having to go through the stress of manual stock control…."*

ECP4 with 1—5 years of experience: "*…Also, having the patients' health record at the mercy of my mouse pad mean that I won't be clueless and hence looked unprofessional when next a particular patient come into the store…."*

Respondents also observed that the use of ICT-based techniques would be good for the business side of their profession in as much as it would be good for patients when they receive the correct drug prescription electronically from the prescriber without having to worry about its exactness. Hence, a concise explanatory response given by one of the superintendent community pharmacists goes thus:

SCP2 with 5—10 years of Experience: *"…we face challenges every day and majority of these often arise from medication error thanks to illiteracy of the patient. Here, most patients enter the store with the incorrect prescription and even without a real prescription at times due*

to one reason or the other and this often left us in a state confusion and as such we are often forced to reach the prescribing doctor or nurse (those we have their contact on mobile phones) of a particular hospital the patient is coming from and authenticate such prescription…."

Respondents also highlighted the potential benefits of ICT-based technique usage in their work station to patients as well as other health professionals involved with the public health. Respondents expressed strong concern for threat to patient's safety due to issues arising from drug medication error. These are pronounced in other critically weighed responses that were transcribed as follows:

ECP2 with 1—5 years of experience: *"…we are the closest to patients and I think ICTs would be valuable tools in attending to patients especially the elderly ones and those who are quite distanced from us. This is because these elderly people often find it hard to keep up with the progress of their health and as such usually needs constant visit to the pharmacy on minor ailment that could be managed through telecare as I believed. So if such system should exist I think they can receive care from us right in their comfort zone, saving them extra energy…."*

DCP with more than 10 years of experience: *"…Medication error is not just a challenge faced by we community pharmacists alone, it is a problem for all pharmacists, the prescribers and the patients as all of us are always left red faced when situations arise from it and if I am to be rational, I would say no one can be blamed to a greater extent as we health providers prioritize patients' safety, and they (patients) wouldn't do something that would endanger them if they knew it would. But mistakes are inevitable at times and hence drug/medication error is a generic problem…."*

DCP with more than 10 years of experience: "*…as professional with strong inclination for ICT usage in providing care for patients, I am sure that we stakeholders would have a common tool to combat this problem as a cohesive unit…through it usage, our work would be more organized and legible, professional trustworthiness would be achieved with other health professionals and potentials errors would be easily tracked and corrected together before patients safety which we are all concerned about could be compromised….*"

4.3.5 Theme 5: Community Pharmacy and ICTs— Implementation, Barriers and Suggestions

Although pharmacists perceived HIT, E-Rx and telecare as novel prospective addition to the practice of community pharmacy in the area of study and Nigeria at large, respondents are concurrently at loggerhead about its feasibility and highlighted several bottlenecks including lack of real training/inexperience about the ICT techniques on the pharmacists side, illiteracy and financial constraints on the patients side as well as infrastructural shortcomings and lack of enough investment in the practice of community pharmacy by major stakeholders.

Engaged respondents overly stated that community pharmacists in the area really lack technical experience when it comes to ICT-based techniques and suggested that a way should be created for that to be cultivated. They also highlighted the poor understanding of ICT-based technique by large proportion of the public which would affect its reception in the formative years and calls for a move from the popular archaic methods to contemporaneous ones seen in the advanced world today. They believe it would be challenging but nevertheless possible to be done if the right course of actions is followed

ECP4 with 1—5 years of experience: *"…We pharmacists quite understand how these ICT techniques work in the advanced world, what we need is training before it can be implemented. The same cannot be said of patients here as majority are not educated to a greater extent, hoard their biodatas and health information and are quite paranoid when it comes to something that has to do with e-network…."*

ECP2 with 1—5 years of experience: *"…I've never received any training on any of the ICT techniques we have been discussing all this while. I am only aware of them, how they work, and benefit they come with based on what I familiarized myself with not that I've had first-hand experience. However, if such should be introduced here, I would welcome it with open hands but it would be challenging… so I think on a scale of 10, the feasibility would be 2 at present…."*

Respondents also expressed great concern about the technology being implemented and failing over time due to poor infrastructural development such as poor power supply and financial constraint (which also reflect in the poor economy of the country) in the location of study and would rather prefer the current system to be in use at least until when the power situation among host of other infrastructural issues in the area are addressed. This is pronounced accordingly below:

SCP2 with 5—10 years of Experience: *"...I don't think it would be feasible to implement such here. Let's be rational on this, compared to the advanced world most of the pharmacists here doesn't have the sound knowledge and technical skill needed for this yet and training would definitely be required to start with. Secondly, we are nowhere to be seen when it comes to stable infrastructural facilities seen in the advanced world, imagine a situation where we have chosen electronic prescription as the only route to dish out patients' medication only to experience power outage for three straight days and prescriptions need to be filled. What do we*

do? Or what about the failure of the server and router through which we would need to transmit and exchange vital information....”

DCP with more than 10 years of experience: *“…I’ve been in this field for some time now and I’ve received both theoretical and professional training not only on the use of the techniques discussed here but also several others when I was abroad. You see, if I am to rationalize the implementation of such here, I would say it is still far-fetched but that doesn’t mean it can’t be achieved if we pool our resources together and work towards a common goal in this country….”*

DCP with more than 10 years of experience: “*...Aside from poor infrastructural facilities, most community pharmacies here and perhaps the whole federation are operating on a tight budget and if they somehow manage to get it off the ground, whether they can bear the cost of maintaining it over a foreseeable future is another thing as majority of patients we attend to here are neither financially buoyant nor covered by health insurance. So individual pharmacy owner won’t risk incurring extra cost for services that they know out rightly that patients won’t be able to pay for in the long run….”*

SCP1 with 5—10 years of Experience: *“…To some extent I’ve received a training about these techniques through an online platform some years back and with what I learnt those days, I see it implementable here if we can take it one step at a time with significant backing from various organizations like the ministry of health who can facilitate the creation of patients’ e-health system and the Pharmacists Council of Nigeria and the likes because we are talking about a system we are earmarking as long term solution to various problem we are facing not something that would just be another fad….”*

CHAPTER FIVE

RESEARCH DISCUSSION, RECOMMENDATION AND CONCLUSION

5.1 Discussion

The exploration of the impact of ICTs in the practice of community pharmacy in the selected locality using qualitative research pedagogy led to the generation of key themes which helps in getting a clear contemporaneous picture of the practice of community pharmacy Nigeria, community pharmacists' professionalism and the position they maintain in the Nigeria public health system. Based on the research findings obtained from semi-structured interviews conducted on licensed and practicing pharmacists in Eti Osa LGA, Lagos metropolis, it is found that information and communication technology just like how it always enhances and thus redefine professional functions in every work station, can also redefine community pharmacy practice in Nigeria. In the present research study area community pharmacists, which discharge their professional duties in a standalone pharmacy were well conversant with the concept of ICT application which is somehow lacking in the practice of community pharmacy in developing countries such as Nigeria. The level of resourcefulness about the use of ICT in the practice of community pharmacy as demonstrated by respondents in this present study can be rationalized perhaps and partly to the level of education these pharmacists must have received as budding pharmacists and as well as well as subsequent familiarization with the latest development in their work station in the developed world. Nevertheless, respondents' resourcefulness as demonstrated during the interview doesn't translate to technical prowess especially in the young community pharmacists (in term of working experience). This is because the use of ICT-based techniques such as Health Information System and Electronic Prescription Services were non-existent in their professional work station which somehow affected their expected level of professionalism, while

a sizeable part of their working hours are lost in manual tasks that could be fast-tracked with the use of ICT-based techniques. The findings made here is also in agreement with other research findings reported across literatures such as the work of Hashimi and colleagues (2017) who observed that the non-existent or usage of ICT-based techniques such as Electronic Prescription in the line of duty of community pharmacists strained these health professionals who had to deal with the enormous workload that comes with manual filling of medication prescriptions, while researchers including Afolabi and Oyebisi (2007) as well Leung and colleagues (2013) opined that the professional duties of community pharmacists in Nigeria do not measure up greatly as ICT-based techniques which would help offset the never ending problems of medication error were lacking. Consequently, community pharmacists in the present studies advocated for the introduction of such ICT based techniques into their work station and laid much emphasis on the need of real technical and professional training on the use of these ICT techniques which they regard as one of the key determinants that would make them to be flexible while discharging their professional functions, saving them a sizeable time that had been chunked and helping combat problems such as medication errors. Thus, based on the respondents' opinion in the present study, it is safe to state overtly that that due to non-adoption and usage of ICT based techniques in the present study's location and perhaps the whole of Nigeria, community pharmacists they are professionally constrained and overworked by manual tasks which could impair their professional functions and have net impact on the Nigerian health system as problems arising from the incessant medication error could become more pronounced when the workload is too much for pharmacists to bear on busy days.

The positive reception of the potential introduction and adoption of ICT based techniques such as electronic prescription and health information technology as well as great emphasis on the

need for training by respondents also help in theorizing "professional marginalization" somehow exist in the practice of community pharmacy in the study's locale. For example, in one of the consulted literatures, it was reported that in the advanced world such as Australia, United kingdom and United States to mention a few, community pharmacists have significant access to patient related health information like the patient's health profile (e.g. medical history and laboratory values) made available through centralized e-health database facilitated by the Health Information Technology and hence enjoy strong mutual relationship with other health professionals associated with the public health (Millonig et al., 2002). This indicate the existence of "professional inclusion" for community pharmacists in these advanced world courtesy of ICT-technique. However, in the present study, the engaged community pharmacists opined that although they are the first point of contact for patients and thus expected to have first-hand knowledge on their patient's health and medication history at least in theory. But it was observed that such is not the case in the practice of community pharmacy in the research area studied as majority of the respondents stated that they barely enjoy strong collaborative relationship with other health professionals and as a consequence have little or no information on the patients which often affect their decision making when dealing with same patients after another visit to the pharmacy. Hence it is safe to reaffirm the theory that community pharmacists in this area of study are indeed "professionally marginalized" if not "professionally excluded" as the non-availability of centralized e-health data represents another limiting factor in building collaborative relationship with other healthcare providers and could consequently affect profession decision in rendering specific and patient-centric services. Thus, respondents saw this as being detrimental to their stance as "modern pharmacist" in the public health and therefore supported the creation of electronic central health information data base from which they can get all the necessary details

on their patient history. Respondents were convinced that if such is facilitated coupled with the introduction and use of other ICT techniques seen in the advanced world, they would help them in decision making, enhanced the provision of patient-oriented services, ease the work of other health professionals (as smooth exchange of information would be facilitated) and contribute greatly to the safety of patients on their tab and hence the public health at large.

Furthermore, as one respondent would describe it, incessant medication error (arising from manual prescription) and falsified medicines which greatly endanger patients is one of the many challenges they faced and fingers are easily pointed at pharmacists in the locality of study which make often culminated in the loss of public trust and damage to their image. This means that community pharmacists are perhaps at the receiving end of blame even for errors which they had little or no influence on as far as it is related to pharmaceutical products. This is also echoed in other literatures such as the work of Omotosho and Colleagues (2018) posited that the process of managing written prescriptions consumes substantial time for prescribers and are prone to errors and miscommunication, which sometimes results in patient harm. Thus, respondents believed that the introduction of electronic prescription into their work station as well as other techniques such as barcode scanning would help in offsetting these problems as the former would facilitate the direct receipt from prescriber within short time while the latter would help to filter falsified medicines or medicines lacking the active pharmaceutical ingredient (API) before being stocked and resold to the public and hence protecting their professional image. Based on this as well as host of other opinions from respondents, it is imperative to state here that ICT-based techniques would save community pharmacists extra time, help them in preventing miscommunication that could harm patients, enhance public trust and make them to be more confident in what they do as they would not have to worry about public distrust.

The idea of the use of ICT techniques as standardized tools in the practice of community pharmacy in the area of study sat well with respondents, but not all were convinced about the immediate implementation owing to series of limiting factors including professional inexperience, low level of education, patients' illiteracy, poor infrastructural facilities and insufficient financial input by stakeholders and government parastatals being the major excuse cited by respondents. These factors especially the lack of significant financial inputs as well high cost of adoption were cited as factors that majorly limit the adoption of implementation of ICT-based techniques in the professional work station of community pharmacists (Morton and Wiedenbeck, 2010). Respondents believed that the process of implementing ICTs in the work station of community pharmacy could be achieved by ensuring all licensed and practicing pharmacists needs to be trained. This technical training could be started from the scratch by including it as standardized requirement in the curriculum activities of "budding pharmacists" in Nigeria so as to cultivate technical skill while those in the field could be taken through series of professional training and support programs. Furthermore, it is observed in the present study that the general the public (of which most are not well educated) needs to be enlightened on what ICT in health sector is all about. This is rationalized from respondents' opinions they patients in the current research location and perhaps Nigerians at large do not cooperate to a greater extent in sharing their health information as they are always worried about privacy protection. Hence they need to be assured that their health data privacy would not be breached which would enable them to provide all relevant information that would assist not only community pharmacists but all health professionals in doing their job. The government is also called on by respondents to work on the infrastructural condition of the state and support the practice of community pharmacy directly or indirectly

through their organizations (PCN or ACPN) in providing various incentives which would assist them in taking the program off the ground and maintaining it in the long run.

5.2 Recommendation

The role information and communication technology play in our lives is priceless, and in current age in which virtually all things are going digital, the role it plays in various work stations is even insurmountable. It is a dominant mover of change, reforming work methodology, redefining job functions and increasing the level of professionalism in people leading to increased operational efficiency as tasks can be complemented within the shortest time possible, problems can be traced, identified and corrected without affecting work flow to a greater extent. Although the practice of community pharmacy morphed greatly during the time when ICT usage in the practice was not as dominant as it is today, the introduction of this technology into the professional setting of community pharmacy marked a turning point as services rendered by professionals of this field today now extends to other wide range of activities described as extended pharmacy services of which majority are discharged through the use of ICT based techniques. Just like any other developing country, the practice of community pharmacy in Nigeria is still overshadowed greatly by various bottlenecks not limited to no use of ICT based techniques in the practice but also other activities ascribed to community pharmacists which are not discharged by professionals of this field.

Phenomenon not limited to as falsified medicines, medication error, less patient-oriented services provision still weighs down the practice of community pharmacy in Nigeria and consequently, community pharmacies and their professionals in Nigeria really have a long way to

go in order to be recognized as important health professionals in the public health system of Nigeria. The present research study did well to explore the usage of ICT-based techniques in the practice of community pharmacy in the selected locality of Eti Osa, Lagos metropolis and found that ICT-based techniques was non-existent in the professional setting of the area explored. Interestingly enough, it was unraveled that community pharmacists here don not share much professional relationship with other major health professionals in the state and a true e-health central database from which they can access information about patients was inexistent. Although the location of study might not be convincing enough to make conclusion that the situation is all the same everywhere in Nigeria given the relatively small number of community pharmacists engaged. However, the implication of such findings made here are quite insightful and strong enough to act as one of the several blueprints for future research studies on a large scale.

Nigeria is earmarked to be among the leading nations in years to come, and for this to happen, it has to be strong on all fronts especially the health system and starting with the community pharmacy (which is among the primary health sector of the country), technological improvements needs to be made and ICT-based techniques introduction, implementation and usage in this professional settings needs to be at the heart of all stakeholders associated with the nation's health system. In order for all this to be brought alive, all and sundry needs to be on the same page; citizens should be ready to cooperate fully with pharmacists and physicians when it comes to health issues, strong professional rapport needs to be established such that no health professional would be professionally marginalized as in the case of community pharmacists in the Nigerian health system, government, corporate bodies as well as other stakeholders need to be aware and play their due role towards the achievement of this collective goals.

5.3 Suggestions for Future Research

Through the exploration of the use of novel ICT based techniques in the professional work station of community pharmacists in the locality of Eti-Osa, Lagos state metropolis, various findings that could serve as blueprint for future research study were unraveled. The following are the key suggested themes that could be adapted for future study in relation to the practice of community pharmacy not only in the present locality of study but other areas across Nigeria where the practice of community pharmacy is well pronounced

1. **Re-Exploration of the Present Research**: The present study was modeled on qualitative research pedagogy and the various unanticipated constraints as well the relatively small sample size used here account for the major limitations. In case of the small sample size, the pharmacists engaged cannot be used to capture and project the thought and perception of the whole of community pharmacists in Nigeria. Hence, this limitation could be addressed through the use of a new research model inform of quantitative archetype which would facilitate a robust approach through the use of a large randomized sample enough to make empirical measurements on the phenomenon explored and hence re-solidifying the claims stated in the present study. Moreover, empirical measurements are not made in the present study, a quantitative research having same focus would enable true measurement to be made and weighed without being clustered to one end.

2. **Exploration of the Present Research Developments**: Through the frame of reference of pharmacists engaged in the present study, two new concepts were identified and effectively theorized based on the non-existent of ICT-based techniques such as e-Health Information System in the locality of study. These theorized concepts are “Professional

Marginalization" and "Professional Exclusion" of community pharmacists in the Nigerian public health system. In the present work, community pharmacists felt that they are being marginalized thanks to the non-usage of ICT based techniques in their work station, and professionally excluded as a result of little or no collaboration with other health professionals when it comes to patient issues as they usually have no lead on most patients' health information and hence the condition. These two identified and theorized concepts represent another research interest and can be subjected to future studies using either qualitative or quantitative research archetype in accounting for their true existence in the practice of community pharmacy in Nigeria.

APPENDIX I: RESEARCH TOOL

EXPLORATION OF THE IMPACT OF INFORMATION AND COMUNICATION TECHNOLOGY DEVELOPMENT ON COMMUNITY PHARMACY PRACTICES IN NIGERIA

Gender

Male ☐ Female ☐

Experience (Years)

1-5 years ☐ 6-10 years ☐ >10 years ☐

Qualification

M.Phil. ☐ Pharm. D. ☐ B. Pharm ☐ Other Qualification ☐

Role in the Pharmacy

Director ☐ Employee ☐ Other (Please Specify) ☐

Please tick the appropriate boxes and respond to all of the following questions by giving appropriate answers in writing format in the space designed under each of the questions

A. Familiarity with Electronic Prescription and Telecare

1. As a pharmacist, are you aware of electronic prescription? What would you say about the use of this ICT based technique in attending to patients' need in your locality?

2. In the last five years, how do you access patients' health records, prescribe patients' drugs and medicine and make it accessible to them?

3. In the last 5 years, to what extent have you effectively use computerized systems such as telecare in attending to patients (especially the adults and disabled) under the practice of community pharmacy?

B. Reception and Adoption of Electronic Prescription and Telecare Services

4. What is your perception about the potential use of computerized network in storing and accessing patients' health records, electronic prescription and delivery of drugs and medicine in your locality?

5. Given the popularity of the current techniques used in processing patients records and other community pharmacy practices, what do you think of the feasibility of electronic health

information technology, electronic prescription and telecare services in your locality as seen in the developed world?

6. What do you think these ICT techniques will do to community pharmacy practice? And in what way(s) would it benefit pharmacists, patients (of which some are illiterate) and other stakeholders?

C. Training and Implementation of Electronic Prescription, and Telecare Services

7. As a qualified and practicing community pharmacist, have you attended or received any seminar briefing/formal training or any of their equivalent on the use of health information technology, electronic prescription and telecare services in relation to your line of duty and practices?

8. Given the level of technological advancements in your locality, and as a practicing pharmacist how do you think the use of computerized network, electronic prescription and telecare services could be implemented and enhanced in community pharmacy practice seen in your area?

D. Policy and Barriers

9. What is your view on electronic prescription and telecare services becoming a standardized technique and replacing the conventional methods used in community services in your locality?

10. Is there any challenge(s) you think could limit the adoption and effective implementation of electronic prescription and telecare services usage in community pharmacy practices within your locality?

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