“An Analysis of Drug Distribution and Medication Errors to Improve Pharmaceutical Services in Nigeria”

Research dissertation presented in partial fulfilment of the requirements for the degree of MSc in Pharmaceutical Business and Technology (QQI)

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May 2021.

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I certify that the dissertation entitled:
“An Analysis of Drug Distribution and Medication Errors to Improve Pharmaceutical Services in Nigeria”

submitted for MSc to the department of Pharmaceutical Business and Technology, Griffith College Dublin is the result of my own work and that where reference is made to the work of others, due acknowledgment is given.

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ABSTRACT

The problem of medication errors represents risks in public health with negative consequences on patient's wellbeing. Globally, healthcare sectors face more challenges addressing the incidents of medication errors due to underlining factors such as severe funding shortfalls, low patient-physician ratio, inadequate infrastructure and low technological inputs amongst others. Given the foregoing, this study employed a qualitative research design aided with a key informant interview of seven (7) public healthcare experts to examine the drug distribution and administration system of Nigeria's public healthcare setting. The primary data derived from public health experts with both theoretical and practical knowledge of Nigeria's public hospital settings were examined against the secondary data derived from the review of extant literature. The outcomes suggest that systemic problems such as the weak political will of the government to effectively fund its healthcare sector, low workers engagement, weak supervision, anemic enforcement, non-adherence to standard procedures, shortage of healthcare professionals (HCP), low patient awareness, poor organizational culture amongst others represent factors precipitating medication errors.

To reverse these significant problems, the study made recommendations comprising the reimagining of the boards and the personnel administration of the hospitals to include individuals from the organized private sector, to enhance best practices and modern HRM practices. Others include the government should boost public funding for the sector, incentivize skilled and experienced HCPs to exercise better supervision, deploy automation to digitally safeguard the system, incentivize medical and nursing education to sustain recruitment pipeline, mandate periodic training for HCP, and the introduction of a mandatory patient awareness booklet to boost public awareness of what constitutes medication errors, the introduction of a mandatory clinical audit review of public hospitals to be conducted by a third party from the private sector, and reorganizing the governance boards of government administered to include non-bureaucrats and seasoned professionals. These are needed to greatly reduce the incident of medication errors in Nigeria's hospital settings.

Key Words: Medication Errors, Medication Errors Administration, Healthcare Professionals, patient's medication safety.

Contents

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

ADE - Adverse Drug Events

ADR - Adverse Drug Reaction

DUR- Drug Utilisation Review

GMP- Good Manufacturing Practise

HCP - Healthcare Professionals

Individual Case Safety Reports: ICSRs

Lagos State Primary HealthCare Board: LSPHCB

LMICs – Low and Medium Income Countries

MAE - Medication Administration Errors

MAR- Medication Administration Record

MEs- Medication Errors

NAFDAC- National Agency for Food and Drug Control.

National Drug Formulary: NPF

NDDG - National Drug Distribution Guidelines

NCCMERP- National Coordinating Council for Medication Error Reporting and Prevention

NSCMP- National Supply Chain Management Program

NMA-Nigeria Medical Association

NMEP- Nigeria's National Malarial Elimination Program

NAPPMED- National Association of Patent and Proprietary Medicine Dealers

NMCN- Nursing and Midwifery Council of Nigeria

PCN - Pharmacists Council of Nigeria.

PCDW- pharmaceutical care daily worksheet

PSN- Pharmaceutical Society of Nigeria:

PCN- Pharmaceutical Council of Nigeria

PHC- Primary Health Care: PHC

SSA- Sub-Saharan Africa

STG- Standard Treatment Guidelines

UK- United Kingdom: UK

UHC- Universal Health Coverage

US- United States

WHO - World Health Organization.

CHAPTER ONE: INTRODUCTION

1.1 OVERVIEW

The problem of medication error is a global concern as both developed and developing nations are not exempted from the severe threats it presents to public healthcare (WHO, 2010). Drug distribution and dispensing is required to deliver efficient execution of drug administration to improve patients' wellbeing by providing quality products and services (Ajemigbitse *et al.*, 2013). This has become important as the problems of medication errors remain a significant challenge to the wellbeing of patients globally (WHO, 2013). The data obtained from medication errors across the world is worrisome particularly from a developed country like the United States of America. It was reported that in the last ten years, an estimated 8 million deaths have been attributed to conventional medicine, with the American Medical system described as the number one killer in the U.S. (Anderson & Townsend, 2010).

This is even more obvious in Sub-Saharan Africa (SSA) where access to quality and affordable pharmaceutical services constitutes a significant challenge as public health infrastructure and human resources continue to experience a huge deficit (Oshikoya *et al.*, 2013; Ayorinde & Alabi, 2019). SSA is perhaps the most dependent on external sources for the bulk of its pharmaceuticals and the need to access quality medicines continue to put in the spotlight drug distribution and dispensing in healthcare governance owing to the challenges of medication errors (Auta *et al.*, 2016).

In Nigeria, the demand for a public healthcare system that can adequately cater for the country's growing population remains a longstanding institutional need (Ajemigbitse *et al.,* 2019). Patients' care is more than before challenging prevailing orthodoxies as the need to stem and possibly eradicate medication-related injuries has assumed an even greater momentum from public health campaigners (Rolfe, *et al*, 2018). This is as patient injuries caused by medication errors (MEs) represent one of the most pervasive incidents in hospitals (Sutherland *et al.,* 2020)

In developing countries like Nigeria, the drug distribution infrastructure faces enormous challenges as the country strives to tackle the incidences of fake, adulterated and substandard products (Agu *et al.*, 2014). This may also be underscored by the longstanding problems of accountability and weak adherence to due diligence confronting Nigeria's medication administration system. More so there are few studies carried out to audit prescriptions in medical facilities for the purpose of reducing medication errors (Animasahun *et al.*, 2019).

There is the urgency of ensuring patients and consumers have access to safe, quality and rational use of drugs in the country. To this end, Nigeria's National drug distribution guidelines (NDDG) was conceived to ensure best practices in the country's drug distribution and dispensing system (Auta *et al.,* 2016).

The NDDG is intended to strengthen the drug distribution and dispensing system so that medicines administered to patients/consumers in all parts of Nigeria do not only meet the highest quality standard but also ensure their rational and safe consumption (Ayorinde & Alabi, 2019). However, medication errors in both private and public hospitals continue to present a considerable danger to patients/consumers safety in the country especially they operate without much disclosure on the matter. Medication error in drug distribution and dispensing causes preventable patients' morbidity and mortality.

According to the WHO, common factors precipitating medication errors include but not limited to undecipherable handwriting of prescribers who are mostly medical practitioners, negligence on the part of practitioners to state drug orders, not selecting the right drug, labelling and packaging complications amongst others (WHO, 2010). Keers *et al.,* (2013) posits that medication errors are symptoms of systemic failures in the drug distribution and dispensing system of a healthcare institution. This may hold some significance since human errors in the drug distribution and dispensing system cannot be completely ruled out and will require strong institutional safeguards to quickly detect and remedy.

1.2 RESEARCH PURPOSE

Medication errors continue to result in significant patients' mortality and huge financial losses to public health systems (Sutherland *et al.*, 2020; Brennan-Bourdon *et al.,* 2020).

A study conducted by Ajemigbitse *et al.* (2013) focusing on the patient safety governance and adherence to the Standard Treatment Guidelines (STG) in a tertiary healthcare institution in South-west Nigeria, the authors utilized in-patient records as the basis of analysis with findings which indicated a prescribing error rate of 40.9%. The authors conclude that medication error was rife in the hospital and this was attributed to prescribers' failings to abide by STG. It was found that prescribers omitted the duration for medication therapy and also widely utilized unsafe abbreviations in writing a prescription.

In another study conducted by Agu *et al*. (2014) to assess the incidence rate of medication errors in 14 antiretroviral therapy (ART) centres in Nigeria, the authors used pharmaceutical care daily worksheet (PCDW) and arrived at findings indicating medication error rate of 41 per 100 persons and this was mostly attributed to incorrect dosage and medications combination. Ogunleye *et al.*, (2016) study surveyed 2,386 healthcare professionals (Doctors, pharmacists & Nurses) from nine tertiary healthcare institutions in Nigeria to assess self-reported medication errors among practitioners found a 47% non-adherence rate.

Therefore, medication error represents one of the significant challenges Nigeria public healthcare system will need to holistically tackle to improve patient care in the country. The majority of Nigeria's population rely on public health institutions to access care and a medication administration system that can ensure low medication errors is of national importance. Thus, the purpose of this study is to critically assess Nigeria's medication administration to identify gaps that may be precipitating high medication errors. This is needed in order to proffer solutions that are practicable, effective and inclusive in improving the medication administration system to greatly reduce medication errors in Nigeria.

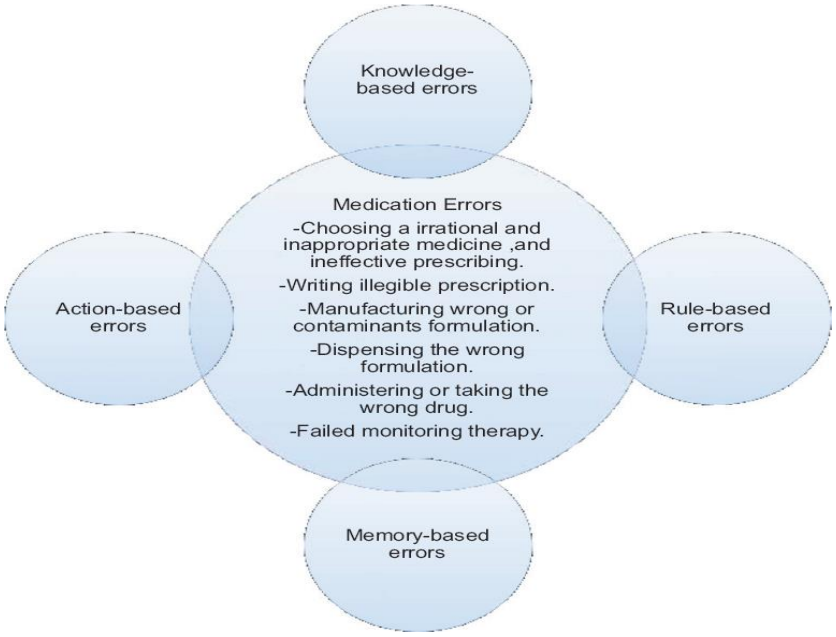

Figure 1: Type and Causes of Medication Errors.

1.3 SIGNIFICANCE OF STUDY

This study may provide outcomes that policymakers in Nigeria's public health system will find valuable in developing a framework that can help improve Health Care Professionals (HCP) level of professionalism in the distribution and dispensing of medicines to both in-patients and out-patients.

It will help identify strategies that could be implemented to address funding gaps in Nigeria's public health care system that have limited the widespread adoption of information technology for medication management especially at the prescribing stage where most medication errors do occur.

The study will also offer insight into how to improve employee engagement in public hospitals in Nigeria. Staff burnout, lack of periodic training & development, low remuneration and high attrition and high attrition rate are significant issues that continue to expose medication management in public hospitals, clinics and health facilities to enormous risks in Nigeria.

1.4 RESEARCH AIM, OBJECTIVES AND QUESTIONS

The aim of this research is to critically evaluate the drug distribution and dispensing system in order to explore strategies that can greatly reduce medication errors and ensure highest level of patient's medication safety in Nigeria's public healthcare institutions. To achieve this aim, the following objectives shall be undertaken and questions used to elicit information.

Research Objectives	Research Questions
• To examine the institutional framework governing medication distribution and administration in Nigeria's public healthcare system.	• Can the current institutional framework governing medication administration in Nigeria's public healthcare system effectively tackle medication errors? • What are the factors that present enormous challenges to medication administration and monitoring in Nigeria's public healthcare centres?
• To assess people management policy in Nigeria's public healthcare system with regards to medication error and patient safety.	• Does the people management policy in Nigeria's public healthcare system affect patient safety with regards to medication errors? • What are the gaps in the management of HCPs that may be accelerating the problems of medication errors? • Taking into consideration global best practices, how you describe the management of healthcare professionals (HCPs) in Nigeria's healthcare centres?
• To explore strategies with potentials to address gaps	• What are the strategies needed to address gaps in Nigeria's medication administration

in Nigeria's medication administration that can greatly reduce medication errors and improve patient safety in the country's public healthcare system.	with regards to medication errors and patient safety in the country's public healthcare system? • What are the lessons on the tackling of medication errors from other countries we can learn from? • What are the steps that would be needed to reimagined HCPs management to respond effectively in tackling medication errors in Nigeria's public healthcare centres? • What technology stacks would recommend and how can they be widely deployed to greatly reduce the problems of medication errors among HCPs?

1.5 RESEARCH METHODOLOGY

This study was dictated by the philosophical exemplar of interpretivism. This paradigm with its naturalist methodology seeks to understand and interpret a phenomenon or reality within its real-life context (Saunders *et al.,* 2012). Thus, as a constructivist paradigm that sees reality as socially constructed, interpretivism presents a subjective epistemology and a relativist ontology typical of the qualitative research design intended for this study.

The design of the research work is a qualitative case study as it aligns with the interpretivist philosophical paradigm. The qualitative case research design provides a framework for studying a reality in its natural context.

The data collection method undertaken was interview, which generated qualitative data to critically analyze the subject matter. Qualitative data are non-numerical data that come

in the form of text, audio-visual recordings or transcripts and can be generated through methods such as key informant interview, observation, focus group discussion (Punch, 2005).

1.6 STRUCTURE OF STUDY

Chapter One: This consists of the research background and other relevant appendages stating the problems and the rational for the inquiry.

Chapter Two: This states the outcome of the review of existing literature from secondary sources critically reviewed against the research objectives to identify possible gaps that may lead to the refinement of existing theories.

Chapter Three: This expresses the methodology adopted for the collection and analysis of data derived in the course of the study.

Chapter Four: This features data presentation and analysis vital to making sense of the raw data generated in line with the research objectives.

Chapter Five: It consists of the conclusion, recommendations and limitations of the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 OVERVIEW

The administration of safe and quality medicines to patients is a significant responsibility that the public health system of a country should continually strive to accomplish. Access to safe and quality medicines is fundamental to the wellbeing of a society and ensuring healthcare professionals (HCPs) who administer the medicines to patients do so with the highest level of professionalism and adherence to laid down rules for better medication outcome remains a global concern (WHO, 2017; Mekonnen, *et al.*, 2018; Elliot, *et al.*, 2019). The drug distribution and administration system of a public healthcare institution is continuously inundated with the demand to maintain effective regulatory practices to strengthen public confidence and ensure accountability in drug administration (Slight *et al.,* 2019).

However, the effective administration and monitoring of drugs given to patients has assumed a global concern as adverse drug events (ADEs) continue to present a serious risk to public health especially in developing countries where the healthcare systems suffer from severe inadequacies (WHO, 2017; Iloh *et al*, 2020).

Drugs distribution and administration vary across nations and adherence to global best practices is significantly impacted by domestic conditions and institutional capacities (Kefale *et al.,* 2020; Tariq *et al.*, 2021). Medication is what every person will take at one point in time to prevent, treat and improve the quality of physical and psychological wellbeing. As such, there exist some level of risks in drug administration which may lead to negative health consequences that can cause irreversible damage to patient's health and even death due to medication errors (WHO, 2017). This chapter seeks to systematically analyse the literature on the subject matter of drug distribution and medication errors with emphasis on Nigeria's public healthcare system.

Conceptual Framework

Qualitative Design Primary data Purposive Sampling	Key Informant Interview	Expert and In-depth Knowledge Explore New perspectives Critical Findings Solution Driven Strategies
	Technology Driven Medication Management HCPs Training & Development Improved Funding & Staff Remuneration Expand Hiring of HCPs Ensure leadership and financial accountability of Hospital administrators Monthly audit of drug distribution & Dispensing	
	Effectively Monitor Drug Distribution & Dispensing Locate and Quickly tackle medication errors Stem the complacency & weak accountability of HCPs Reduce staff attrition and boost motivation Greatly reduce the incidences of medication errors	

The framework illustrates the processes adopted in examining the subject matter. Thus, emphasis was on critically analysing extant literature to identify gaps, explore ways through which mitigation of medication errors can be enhanced in public hospitals in Nigeria. Therefore, secondary data generated were juxtaposed with primary data generated from key informants to derive a robust outcome described in subsequent chapters.

2.2 DRUG DISTRIBUTION & MEDICATION ERROR

2.2.1 DRUG DISTRIBUTION

The drug distribution system of a healthcare institution is critical to maintaining the well-being of patients. HCPs are crucial to drug distribution in the hospital setting and have a vital responsibility to ensure that medication administration is conducted with maximum patients' safety (WHO, 2017). Therefore, healthcare authorities need to create an accountable medication procurement, storage and distribution system (Cohen & Metzer, 2017). This is consistent with the World Health Organization (WHO) requirements at tackling the spread of medication errors and ensuring a more responsive medication administration for the safety and health of the patients (WHO, 2017).

The hospital drug distribution system is multifaceted as it seeks to not only deliver quality and safe medications but also ensure their safe administration to the patients (Elliot *et al.*, 2019). HCPs have a very important professional responsibility of making critical decisions on pharmaceutical specifications, products, quantities, and supply. Therefore, it is incumbent on hospital administrators to put in place a standard practice regimen with effective medication distribution and administration system aimed at the safe administration of all medicines given to patients (Iloh *et al.,* 2019). This onerous task requires robust leadership on the part of healthcare administrators to ensure standard practices established to mitigate risks in medication administration are not neglected or bypassed (WHO, 2017).

However, in some jurisdictions, hospital medications and other supplies are carried out by contractors who have no healthcare backgrounds, the risk this posed can be mitigated by the establishment of quality standards and specifications that must be adhered to (Sim *et al.*, 2020). In this instance, the public healthcare institution's regulators and management need to continually demonstrate a strong sense of responsibility, professional knowledge and uncompromising judgment in performing their responsibilities to the public (WHO, 2017). The drug distribution system of a healthcare institution is also of economic consequences because of the huge financial cost borne in

the purchase, monitoring of pharmaceuticals administered to patients, and settling of litigation claims (Elliot *et al.*, 2020).

For Low Middle Income Countries (LMICs) such as Nigeria where public health institutions are grossly underfunded, ensuring the resources allocated for drug distribution and administration are well managed is even more required for better drug administration (Ekama *et al.*, 2019). Accordingly, hospital administrators working together with HCPs have a critical responsibility to develop and maintain adequate product specifications to help in the purchase of medicines and other related pharmaceutical supplies to mitigate the risks posed to the formulary system of a healthcare institution (WHO, 2017).

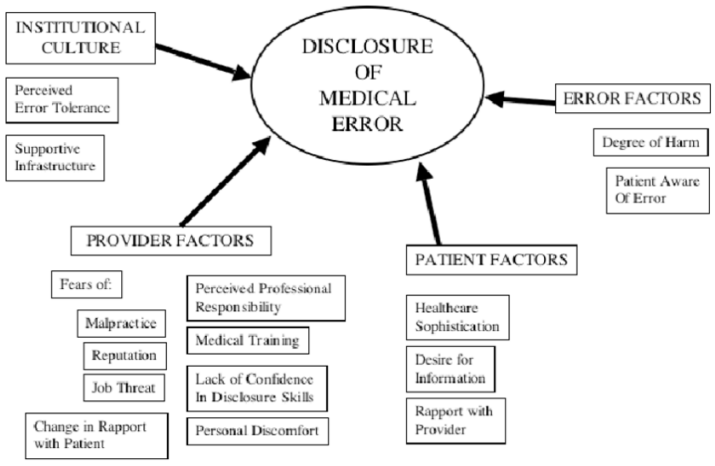

Figure 2: influences on decisions to disclose a Medical Error (2005)

2.2.2 MEDICATION ERRORS

Medication error is one of the significant problems confronting hospitals drug distribution system globally (Slight *et al.*, 2019; Mekonnen *et al.*, 2019). It is a major factor in avoidable patient harm in a health care system and the need to greatly reduce this menace remains vital to ensuring quality health care delivery to the public (WHO, 2017). According to the National Coordinating Council for Medication Error Reporting and Prevention: “a medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer” (NCCMERP, 2015). Medication errors are known to

manifest in different stages of the medication use process such as ordering, transcribing, dispensing and administration. Adverse drug events (ADEs) describe “any injury resulting from medical interventions related to a drug,” while adverse drug reaction (ADR) is “a response to a drug which is noxious and unintended and which occurs at doses normally used in man for prophylaxis, diagnosis or therapy” (WHO, 2017). A medical injury elicited by medication errors is categorised as a preventable ADE and a non-preventable ADEs which is what ADR represents.

ADEs are even more pervasive in LMICs as the incidences of medication errors continue to present significant problems to health care delivery (Mekonnen *et al.*, 2019). Thus, medication administration errors (MAEs) pose severely destructive consequences for healthcare institutions, patients, and healthcare professionals (WHO, 2017). The administration of medications is one of the routine activities in both in-patient and out-patient care vital to a patient’s quick recovery and overall wellbeing.

However, this critical responsibility has become extremely difficult to manage in many jurisdictions. HCPs are responsible for MAEs as the World Health Organisation (WHO) says “Medical errors are human errors in the process of care delivery and are a significant cause of morbidity and mortality among patients with grave consequences for family and public health". According to Elliot *et al.* (2019), medication error is one of the leading causes of in-patient disability and death globally.

As such, MAEs and the associated in-patient's morbidity and mortality are of global concern and even more so in LMICs (WHO, 2017). Even as MAEs represent a global healthcare delivery challenge, they are grossly under-reported and this non-disclosure may run into millions of cases especially in LMICs where record-keeping is still largely manualized and prone to omissions (Mekonnen *et al*, 2019; Iloh *et al*, 2020). MAEs can elicit litigations against a hospital or HCPs especially in highly developed nations where medical personnel accountability is a vital institutional safeguard (Slight *et al.*, 2019).

While MAEs do not necessarily represent unethical medical behaviour; however, the failure to disclose them to the patients and medical authorities may warrant litigations. The disclosure of medical errors is one of the standard medical ethics needed to not only

improve patient safety but to also strengthen the service delivery system of a healthcare institution. The majority of MAEs are caused by human and system negligence precipitated by inadequately formulated and articulated operation of care and unqualified healthcare personnel (Cohen & Smetzer, 2017). This is especially so with HCPs such as physicians and nurses who render in-person care and whose activities can be linked to most of hospital MAEs.

Medication Error Categorization Index (NCCMERP*)

Category	*Result*
Category A	Circumstances or events that have the capacity to cause error.
Category B	An error occurred, but the medication did not reach the patient.
Category C	An error occurred that reached the patient but did not cause patient harm.
Category D	An error occurred that resulted in the need for increased patient monitoring, but no patient harm.
Category E	An error occurred that resulted in the need for treatment or intervention and caused temporary patient harm
Category F	An error occurred that resulted in initial or prolonged hospitalization, and caused temporary patient harm.
Category G	An error occurred that resulted in permanent patient harm.
Category H	An error occurred that resulted in a near-death event.
Category I	An error occurred that resulted in patient death.

*NCCMERP = National Coordinating Council for Medication Error Reporting and

Figure 3: Table illustrating categories of Medication Errors (NCCMERP,2016)

According to the WHO, various dimensions of medical errors exist comprising but not limited to surgical errors, misdiagnoses, procedural errors, uncoordinated care, hospital-acquired diseases, referral errors, and hasty discharged of patients from the hospitals (WHO, 2017). The medication administration process covers four significant components of which medication errors can occur.

Prescribing. The physician is saddled with the responsibility of identifying the right medication needed for the care of a patient. Thus, prescribing or ordering of medications is a vital treatment plan that physician needs to carefully handle to ensure the patient is administered the right medication and dosage (WHO, 2017). Prescribing has to be systematically done by the physician to minimise the risk of medication errors. As such,

the physician has to first diagnose the patient ailment by conducting various tests and monitoring the prescribed medication to ascertain its effectiveness at improving the patient's wellbeing. This stage is prone to medication errors due to the risks of wrong diagnoses. Globally, including Nigeria, wrong diagnoses continue to hugely contribute to the prevalence of medication errors (Elliot *et al.,* 2019; Mekonnen *et al.*, 2019). The WHO guideline regarding drug distribution and administration in hospital settings emphasises the creation of protocols that mandate and monitors HCPs to prescribe within specific guidelines.

Preparation and dispensing: After the physician prescription of a treatment plan, a written instruction is sent to the hospital pharmacist to prepare and dispense the approved medications. In situations where the hospital does not have a pharmacy or its pharmacy does not have the prescribed medication, patients may resort to patronising community drug stores owned by individuals that are not trained, pharmacists. This is particularly so with healthcare facilities in rural areas of Nigeria and this often contributes to medication errors due to illegible handwriting of the prescriber or the lack of the original drugs prescribed (Iloh *et al.*, 2020). Therefore, dispensing of medication is also risk-prone especially amongst outpatients who have to patronise unregulated community pharmacy.

Medication administration: This is a critical phase in the in-patient treatment plan and this is carried out by nurses who administer the medications. Medication errors can occur at this stage if the nursing staff is inexperienced or not properly supervised by the physician or the senior nursing officer as the case may be (WHO, 2017). Inexperienced or untrained nursing staff may overdose the medication prescribed. Also, experienced nursing staff not supervised according to the stated guideline may abuse the system to improperly administer the medications.

Monitoring: Medication administration needs to be monitored to examine the effect on the patient's wellbeing. Thus, having an effective monitoring system is vital to mitigating the risks of medication errors (WHO, 2017). The physician and the nurses who administer the medications have to be professionally up and doing to enhance this stage of the patient's treatment plan (Ogunleye *et al.,* 2016). An effective monitoring system can

promptly identify appropriate changes needed in a patient's treatment plan to improve wellbeing (Cohen & Smetzer, 2017). According to the WHO, monitoring of medication therapy in the hospital can boost the safety and efficacy of a patient's treatment plan. Therefore, it is incumbent on hospital administrators in charge of the healthcare system to regulate medications distribution and administration by strengthening professional standard practice (WHO, 2017).

The WHO advises that the global healthcare system is failing to tackle the challenge of medication errors even as this represents one of the most significant causes of harm to patients and malpractice lawsuits. According to Makary & Daniel (2016) study which employed a survey research design to administer questionnaires to medical professionals in the United States of America, (USA) came out with findings indicating that 42.2% of the practitioners had experienced litigation caused by medication error suffered by a patient under their care. In another study conducted by Bishop *et al.,* (2010) which surveyed primary health physicians in the US found a whopping 59% of the respondents to have had a medical malpractice suit initiated against them.

The risks of HCPs and healthcare institutions facing litigations and claims due to MAEs are rarely so in LMICs and this perhaps may be proliferating more medication errors compared to say developed nations. However, litigations that occur even after full disclosure of medication error has been made may undermine physician's willingness to uphold the vital responsibility of sincerity to the patient. HCPs are ethically expected to notify the patient of all medication administration related errors, this has become imperative to improve physician-related activities in medical care (WHO, 2017).

MAEs undermines a patient physical, financial and emotional wellbeing, attracts professional and reputational damages to HCPs and also elicit other adverse outcomes (Cohen & Smetzer, 2017). The extent of medical errors is hard to quantify in many LMICs and this is because it varies across nations. Again, since MAEs are recorded within individual healthcare institutions, the risks of cover-up cannot be taken for granted as reports may not be sent to the central database. In many instances, patients in LMICs are not even aware they have suffered medication errors due to non-disclosure by HCPs (Iloh

et al., 2019). In Nigeria, reporting medication errors in public healthcare institutions remains a challenge that is often overlooked (Ayorinde & Alabi, 2019). This weak reporting of medication errors may be undermining effective interventions critical to significantly reducing the incidents of medication errors in Nigeria's public healthcare institutions.

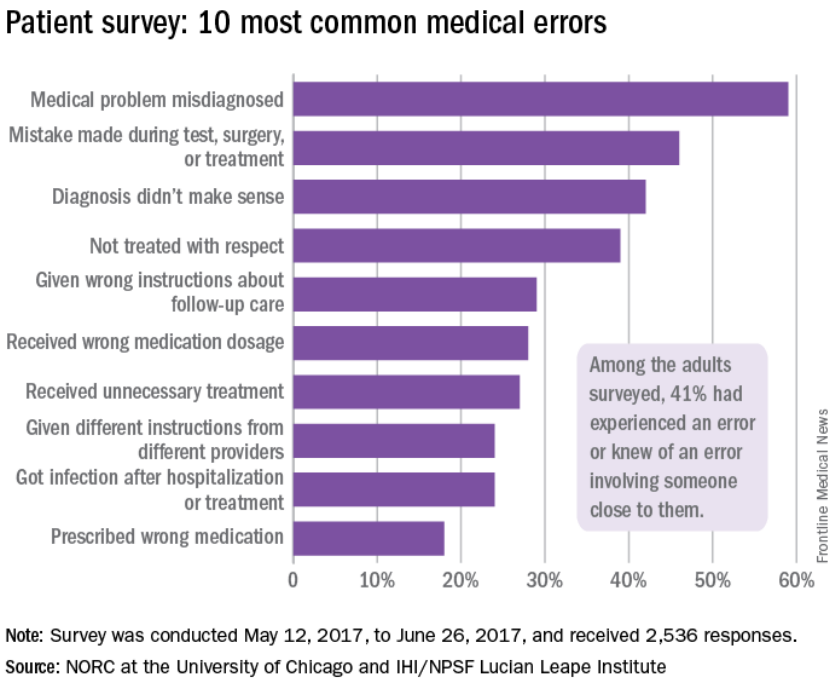

Figure 4: Global Perspective, US as Sited Case

2.3 NIGERIA'S PUBLIC HEALTHCARE SYSTEM

Nigerian public health care system is severely hampered by inadequate funding and increasing brain drain as substantial numbers of HCPs continue to move overseas (Oyekale, 2016; Ogunleye *et al.*, 2016). Thus, Nigeria's patients to physician rate is one of the world's lowest. The country's growing population of more than 200 million people continue to face the problem of quality care especially in the rural areas where funding for primary health institutions remain extremely low (Iloh *et al,* 2020). Thus, Nigerian's rural areas where more than 60% of the country's population reside is vastly underserved leaving many people to resort to self-medication or forced to patronise unregistered

healthcare providers (Ayorinde & Alabi, 2019). Funding for Nigeria's public healthcare system remains a subject of continuous debates owing to whether inadequate funding or mismanagement of funds allocated presents the greater challenge to healthcare delivery in the country. This is as patients' complaints of low level of professionalism and poor services by HCPs in Nigeria's public healthcare remains rife (Ekama *et al.*, 2018). It may require more than increase in funding to improve service delivery to especially in-patients care in Nigeria's publicly owned hospitals. At different times Nigeria's government has sought to address the wide-ranging problems bedeviling the country's healthcare system at the national and sub-national levels.

According to the WHO, Nigeria's public health care system remains weak and this reflects in the fragmentation of services, inequity in resource distribution, dearth of medical supplies, inadequate and collapsing infrastructure, and dismal quality of care (Oyekale, 2017). Admittedly, very few, that is, if there exists a public healthcare system that is not presented with some problems. The Covid-19 pandemic has exposed how countries thought to have a strong healthcare institution experienced serious vulnerabilities. However, these vulnerabilities or weaknesses vary from country to country as LMICs such as Nigeria are more impacted by problems that may be hampering effective service delivery.

2.3.1 MEDICATION ADMINISTRATION IN NIGERIA

The WHO states that there exist pervasive and poorly managed drug distribution systems in LMICs (WHO, 2017), indicating a significant challenge to patient care and physician vulnerabilities to medication errors. Nigeria may not be exempted from the challenges of effective drug distribution in its public healthcare facilities at the primary, secondary and tertiary levels. This is because Nigeria is said to have a drug distribution system is that is largely uncoordinated and contrary to the country's national drug policy (Iloh *et al.*, 2020). This, in turn, compelled Nigeria's federal government to establish the presidential committee on the pharmaceutical sector reform (PCPSR) with a mandate to evolve strategies aimed at the institutionalization of an accountable drug distribution system in

the country's public healthcare system (Ayorinde & Alabi, 2019). Consequently, the National Drug Distribution Guidelines (NDDG) was established to monitor and control drug distribution in Nigeria public healthcare system, and this includes the mandatory reporting of medication errors. As part of the NDDG guidelines, subnational entities such as Nigeria's thirty-six states are to create individual State Drug Distribution Centres (SDDCS), and the private sector to establish Mega Drug Distribution Centres (MDDCS) in major centres of the country (FMOH, 2012). This policy initiative was formulated to address the perennial lack of coordination in Nigeria's drug distribution and administration process. This is as unethical practices in drug distribution and administration in public hospital settings continue to weaken the country's sustainable development goals (SDGs) effort of providing quality healthcare services to its people (Iloh *et al.*, 2020).

Accordingly, Nigeria's Federal Ministry of Health (FMOH) that oversees drug distribution and administration in the country asserts that NDDG aims to “establish a well-ordered drug distribution system for Nigeria”. The menace of substandard and falsified medicines in Nigeria's hospital setting is of concern to quality healthcare delivery and this is further complicated by the growing incidence of medication errors in drug distribution and distribution (Babatunde *et al.*, 2015). Ogbona *et al.* (2015) posits that Nigeria's pharmacovigilance still manifest gaps that have made drugs peddling and other unwholesome practices thrive in the health care delivery system of the country. The ability of the NDDG to tackle the problems confronting Nigeria's drug distribution and administration is still a subject of debate as the over two decades existence of this policy initiative is yet to fully institutionalize best practices in service delivery.

Perhaps, the reason for the subsequent introduction of the Essential Drug List (EDL) and a National Drug Formulary (NDF) to facilitate the nationwide application of accountable drug distribution and control to minimise the incidents of medication errors. While these policies have had some impact on Nigeria's public hospital system by ensuring that HCPs demonstrate a great sense of accountability to their patients by ensuring public and private hospitals put in place mechanisms for mitigating medication errors; however, Nigeria's drug distribution system is still heavily bureaucratized to the detriment of quality service delivery in the country's healthcare system (Ogunleye *et al.*, 2016).

Thus, while it is mandatory for healthcare centres in both public and private hospitals to report all incidents of medication errors, very little oversight is done and penalties are rarely meted to non-complying institutions. As Ajemigbitse *et al.,* (2013) argues, the weak enforcement of standard practices in both public and private hospitals have continued to allow the impunity of HCPs to persists even more as litigation and claims are rarely instituted by patients against HCPs and their employers.

Admittedly, the NDDG guidelines and other accompanying policy initiatives are not created to victimise HCPs; however, their weak implementation maybe allowing medication errors to proliferate in hospital settings even more so in government-owned ones patronized by the majority of Nigeria's population.

2.4 FACTORS LINKED TO MEDICATION ERRORS

2.4.1Shortage of HCPs

Nigeria faces the problem of a severe shortages of trained and committed medical personnel. The country continues to lose its HCPs to other countries that offer them the better condition of service and professional development (Oyekale, 2017). Thus, the ability of HCPs in both Nigeria's public and private hospital settings to ensure an accountable drug distribution and administration system may be difficult to establish. This is because when HCPs lack the requisite skill and the experience, they may demonstrate weaknesses in identifying suspicious products in the hospital supply chain, educate patients on the side effects of drugs, prescribe a wrong prescription or dosage. A single-blinded study conducted by Babatunde *et al.* (2016) to investigate the prevalence rate of medication errors in a kidney treatment hospital in Nigeria found a prescription error rate of 75% caused by prescribers' omission or illegitimacy; the researchers identified the severely low physician-patient ratio and the lack of adequate medication quality assurance as factors precipitating the incidents of medication errors. Ogunleye *et al.* (2016) cross-sectional study which utilized a structured questionnaires survey of 2,386 professionals (46.3% nurses, 44.9% doctors, 8.8% pharmacists) in 8 tertiary hospitals in

Nigeria found a 47% prevalence rate of self-reported medication error and the primary cause was attributed to overwork by the majority (59.2%) of the respondents. Thus, Nigeria maybe facing a situation whereby there is inadequate number of HCPs in Nigeria's public healthcare settings trained to handle the systemic problems confronting drugs administration especially medication errors.

The WHO equally says LMICs such as Nigeria lack adequate personnel with the right skills to ensure drug distribution and administration in hospital settings deliver quality services and mitigate risks such as medication errors. Nigeria is producing fewer HCPs such as physicians, nurses and pharmacists. According to the WHO, Nigeria has physician patient's ratio of 4 doctors to 10,000 patients. The study conducted by Oyekale (2017), that sought to investigate the growing HCPs shortfalls in Nigeria's healthcare settings found countries such as the US, UK, Canada, Saudi Arabia and the UAE to be notable destinations for the country's skilled personnel.

According to Ekama *et al.* (2019) observational study of medication errors among HCPs in one of the largest HIV treatment centres in Nigeria, suggest shortages of experienced doctors and pharmacists is contributing to high medication error rate amongst HCPs with less than 5years HIV care experience. These shortages or shortfalls are even more pronounced in the rural areas and the impact on mitigating medication errors in the drug administration system of Nigeria's hospitals may be far from ideal. This is because the rural areas have long been neglected as the primary healthcare sector continue to face the problems of underfunding and lack of incentives to attract HCPs to come and take up employment. The rising insecurity in the rural areas especially in the northern part of Nigeria may also be acting as disincentives to HCPs. This, in turn, may be exposing hospitals in rural areas to serious risks of medication errors.

2.4.2 Low Funding

Nigeria's budgetary allocation to the health sector is one of the lowest in the world (Iloh *et al.*, 2020). This is reflected in the frequent industrial actions embarked on by medical personnel. According to Arulogun *et al.* (2011), the inadequate funding of the healthcare sector in Nigeria has contributed to poor service delivery in the country's hospital settings.

Ajemigbitse *et al*. (2016), contends that the huge finding gaps in Nigeria's public healthcare sector continue to expose it to the problems of pervasive medication errors. Also, Oyekale (2017) says inadequate funding of the healthcare sector has grossly undermined the development of the sector to offer effective services to the members of the public. Aug *et al*. (2014) asserts that low funding of the health sector undermines Nigeria's drug distribution and administration system ability to effectively mitigate medication errors (Oshikoya *et al.*, 2013).

However, Ogunleye *et al.* (2016) says that while inadequate funding has been documented as a significant problem confronting public healthcare in Nigeria, a more challenging problem faced by the sector is the lack of frugality in managing scarce resources to boost service delivery. Oyekale (2017) argues that administrators of government-owned hospitals are quick to mismanage the resources allocated to them and this has far-reaching consequences on the training of personnel, availability of quality and safe medicines, and services delivery to patients. This may be negatively impacting drug distribution and administration in the public healthcare setting.

This is because medication errors are more prevalent in healthcare settings undermined by low funding as investment in mitigation strategies may be very low or inadequate. The WHO says medication errors are more prevalent in LMICs than in developed countries (WHO, 2017). Again, unlike developed countries, LMICs face a severely disruptive challenge of inadequate funding that continues to affect service delivery aimed at reducing or preventing medication errors.

Iloh *et al*. (2020) conducted a cross-sectional study aimed at investigating medication errors in a resource-constrained context, 185 physicians in Aba in South-East Nigeria were administered questionnaires, the findings indicate that stress and burnout of physicians (100%/185) were attributed to medication errors amongst physicians and that safety incidents reporting, improvement in physician-patient ratio and continued patient safety training should be embraced to decrease medication errors.

2.4.3 Weak Supervision & Reporting Tools

Patients caregiving is not adverse risking; as such, having in place a mechanism for monitoring and reporting drug distribution and administration is crucial for better service delivery (WHO, 2017). Leadership supervision is critical in this instance as HCPs responsible for administering medications to patients may decide to neglect standard procedures in the discharge of their responsibilities. The vast population of Nigeria's more than 200m people get access to Medicare from government-owned hospitals and the hospitals are required to comply with the medication administration guideline, one of which is to promptly report medication errors in the medical incidents report (FMoH, 2012). In addition, is the use of drug utilisation review (DUR) which is an ongoing systematic process aimed at mitigating drug distribution and administration problems such as incorrect product selection, dosing, avoidable adverse drug reactions, and medication errors in dispensing and administration. Thus, DUR can significantly enhance the process of prescribing, administering, monitoring, evaluating, and improving medicine use to ensure the quality and cost-effectiveness of the patient's treatment plan.

These processes have not been automated in Nigeria; as such, they are prone to errors and will require detailed and consistent supervision to ensure strict compliance. According to Ayorinde & Alabi (2019), and effective administration of medication will eventually result in better patient care and efficient use of resources. The researchers went further to assert that lack of effective reporting mechanisms is undermining medication errors in Nigeria's public healthcare settings. Iloh *et al.* (2020) was of the perspective that lack of technological input such as an automated medication process is hampering effective supervisory oversight and this is as Nigeria’s publicly owned hospitals are overstretched and can barely keep up with the demands for quality service delivery.

According to the WHO, technology-based interventions are effective mechanisms that can help improve and mitigate risks in medication distribution such as medication errors leading to adverse drug events. The use of automated dispensing is increasingly being adopted globally as hospital administrators seek a more efficient way to improve the medication distribution and administration process (WHO, 2017). The adoption of

automation has been more prominent in developed and rich nations of the world. However, in resource-limited environments such as LMICs, the high cost of acquiring and maintaining such a technology has grossly limited its adoption in publicly owned hospitals. In Nigeria for example, most publicly owned medical centres still conduct their drug distribution and administration manually (Iloh *et al.*, 2020).

An automated medication process has an integrated real-time function that monitors the inputs of all critical actors in the patient treatment plan and this includes the physician, pharmacist and nurses. This digital platform electronically controls and track all the processes involved in prescribing, dispensing, administering and monitoring the medication given to a patient. Other tools that can be incorporated into the automated system are the patient medication profile and the medication administration record.

The patient medication profile is intended to help monitor the progress of the treatment plan of a patient. This is because a patient's medication profiles comprise vital data on the patient's current and recent medication therapy, diagnosis, allergies, height, weight, age and sex. This process can also be automated for seamless and quick access and assess a patient's medication order system. In addition, a patient medication profile allows the physician to review the medical history of patients before prescribing medication or new medication order. According to the WHO, this can help HCPs to promptly detect and correct medication errors, and even more so when the entire process is enhanced with the adoption of digitisation. The medication administration record (MAR) is a very important tool to enable nurses that administers the prescribed medication to a patient to keep an up-to-date record (WHO, 2017). It also enables the physician and nurses to review the patient's treatment plan and to compare the number of medications dispensed with the quantities administered to the patient. MAR can help to improve the physician routine rounds by enabling the capacity to better review and verify the current medication administered to the patient. Digitized MAR is increasingly being deployed for faster and fewer errors in reporting. This, in turn, can help decrease medication errors through systematic analysis of data derived through digital MAR. A manually operated MAR is still the norm in many LMICs including Nigeria and it presents significant risks towards ensuring a more efficient patient treatment plan (Ayorinde, & Alabi, 2019).

Thus, to keep tabs on the medication process has become even more difficult as the population of people needing hospital care grows with the country's growing population. This is because even when medication errors are reported in the manual incidents report, it may be misplaced or manipulated to cover up evidence. In the privately-run hospitals, supervision may not be a problem, however, medication error reporting is rarely disclosed to the patients and evidential cover-up is rife perhaps to protect their business reputation and forestall litigation and claims (Oyekale, 2017).

Improvements in the supervision of medication administration in publicly owned hospitals used by the vast majority of Nigeria's population may help decrease the incidents of medication errors. However, having hospital administrators oversee all manual medication process may be ineffective in strengthening medication errors reporting and mitigation. Both government and privately own hospitals may have to initiate a digitalized drug distribution and administration process managed by Nigeria's Federal Ministry of Health (FMoH) to improve medication errors reporting and safe dispensing practices of HCPs.

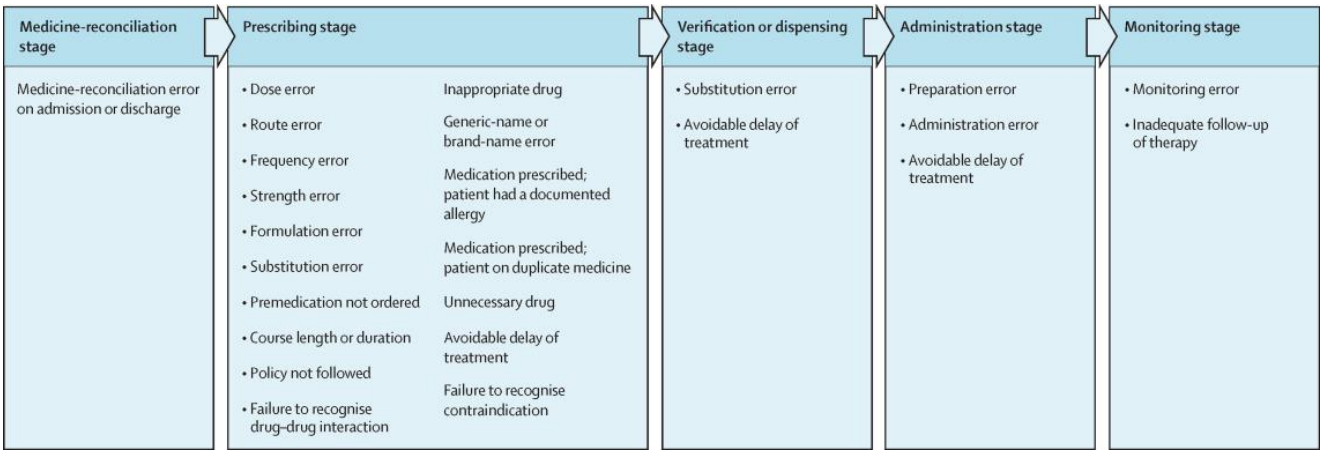

Figure 5: flow chart of medication errors types by stage

2.4.5 Training Inadequacies

Training and credentialing of HCPs will need to accompany the drug distribution and administration process to enhance service delivery and decrease the incidents of medication errors in Nigeria's. Iloh, *et al*, (2020) says that aside from the shortages of HCPs, inadequate training of HCPs is also a significant problem confronting medication administration in Nigeria's hospital setting especially those that are publicly owned. Regular training programmes encompassing doctors, pharmacists, nurses and ancillary health workers is vital towards improving medication administration (Cohen & Smetzer, 2017; Ekama *et al*, 2019).

Experienced and trained HCPs are becoming increasingly less visible as they continue to migrate in high number to other countries of the world. Inadequate funding has contributed to less investment in the training of HCPs and ancillary health workers. Healthcare facilities continuously face the burdens of rendering effective services to their patients. Thus, HCPs face enormous pressures that maybe be better handled if personnel are trained on how to respond using modern techniques to ease the burdens. Mismanagement of resources by hospital administrators has also been identified as an impediment to regular training of HCPs and ancillary health workers (Oyekale, 2017). The problem of financial mismanagement remains a significant problem in publicly owned hospitals in Nigeria and the impact on personnel training may be more debilitating than envisaged if consideration is given to the deteriorating state of public healthcare delivery in Nigeria. Ajemigbitse *et al.* (2013) utilized secondary data derived from in-patients' records from the medical department of a tertiary hospital in South Western part of Nigeria found a 40.9% of medication errors due to lack of strict adherence to standard treatment guidelines and this was attributed to inadequate prescriber education. Ayorinde & Alabi (2019) employed a structured questionnaire administered 300 hundred nurses in a hospital setting came out findings which suggest that while the nurses are aware of the reporting guidelines concerning medication errors, the overwhelming focus on punitive measures create a disincentive not to report medication errors and more emphasis on training and corrective actions are needed.

According to the WHO (2017) continued training of hospital personnel will help strengthen their competencies and enhance their ability to work with less error in the distribution and administration of medicines to patients. This can also improve chains of supervision wherein non-medical staff members of health care institutions in charge of record-keeping are training in digital storage of information and then report to someone qualified to respond adequately to medication errors. This may be useful in Nigeria's situation where there are continued shortages of HCPs. Training and development can help mitigate medication errors but it may not achieve much effect if staff welfare in publicly owned hospitals remains non-competitive. As Ogunleye *et al.* (2016) posited, for any significant change(s) to happen in drug distribution and administration in Nigeria's public health facilities, staffing welfare and professionalism must first be addressed.

2.5 CONCLUSION

The available literature reviewed suggests that medication errors are global health issue that is more prevalent in developing countries such as Nigeria. Drugs distribution and administration is a fundamental feature of a patient's treatment plan and will require systemization to ensure better treatment outcomes and fewer risk exposures to medication errors (WHO, 2017). The medication errors are costly for patients, medical facilities and the government. Prolonged illnesses, permanent disabilities, increase in the cost of treatment and death are the possible consequences associated with medication errors.

The Nigeria's situation reveals that the country has in place mechanisms through National Drug Distribution Guidelines (NDDG) for supervision and control of drug distribution in Nigeria public healthcare system as well as mandatory reporting of medication errors. It also has the Essential Drug List (EDL) and the National Drug Formulary (NDF) to facilitate a nationwide application of accountable drug distribution and control to minimise the incidents of medication errors. Nigeria has sought to boost confidence in its healthcare sector but major gaps still exist that present barriers to the country's medication distribution and administration processes. However, there are some persistent, inherent

and multiple problems that has continuous facilitated the occurrences of medication errors in the Nigeria's public healthcare system. Creating synergy between all the stakeholders in the medication process remains a significant public health concern especially in LMICs such as Nigeria with medication errors presenting a significant problem to healthcare delivery (Ayorinde & Alabi, 2019).

This study aimed at critically appraising the drug distribution and dispensing system in order to explore strategies that can greatly reduce medication errors and ensure highest level of patient's medication safety in Nigeria's public healthcare institutions. The with the objectives of exploring the current institutional framework governing medication distribution and administration in Nigeria's public healthcare system, assess people management policy with regards to medication error and patient safety, and to identify, gather and proffer strategies with potentials to address gaps in Nigeria's medication administration that can greatly reduce medication errors and improve patient safety.

The extant literature suggests amongst other problems such underfunding, low technological input, and shortages of healthcare professionals. The issues recognized will be examined further in this study to determine how they can be addressed to mitigate medication errors in the country healthcare system.

CHAPTER THREE: METHODOLOGY AND RESEARCH DESIGN

1.1 OVERVIEW

Research methodology is an important part of the research study; it shows how research intent to be a scholarly attempt is conducted using an analytical framework to guide in the collation of data, analysis, and presentation of findings. Every research study is propelled by a philosophical principle, and this philosophy helps a researcher on his or her methodical approach to the research activities. This chapter focus on the research philosophical paradigm, the research approach and strategy through the identification of the data gathering and the methodology for data gathering of this study. In addition, the appropriate participants and sample size, and the sampling technique adopted for qualitative data analysis amongst others are presented.

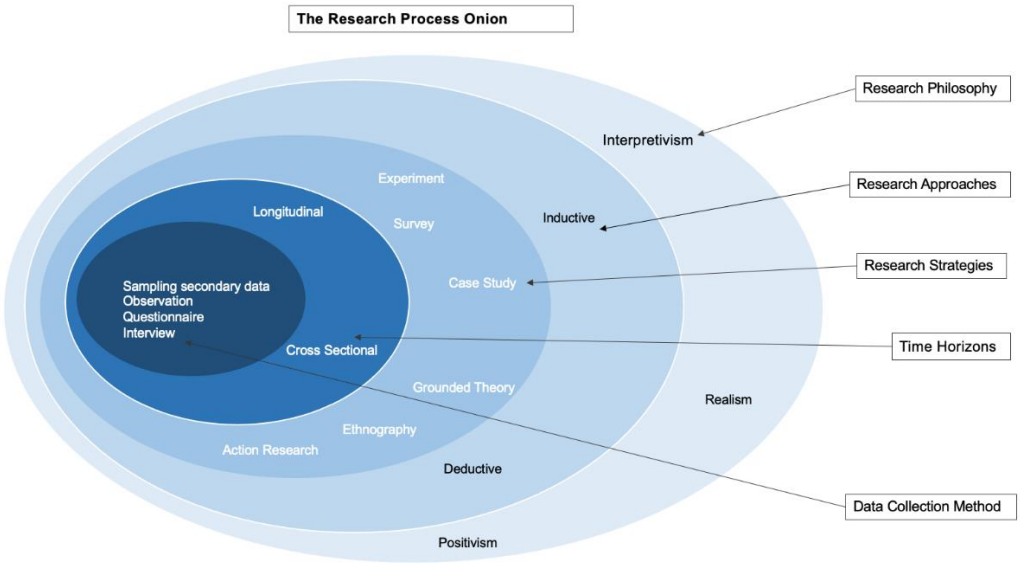

Table 1: Research methodology and primary data collection

Section. No	Primary Data	Medium
1	Approach	Qualitative analysis
2	Philosophy	Interpretivism
3	Source	Key Informant Interview

		(Phone interviews)
4	Structure	35-42 minutes of phone conversations
5	Respondents	medical doctors, nurses, pharmacists from Nigeria Medical Association (NMA), Pharmaceutical Society of Nigeria (PSN), Pharmacist Council of Nigeria (PCN), Nigeria, Nursing and Midwifery Council of Nigeria (NMCN), National Association of Resident Doctors of Nigeria (NARD), Healthcare Administrators Association of Nigeria (HAAN), Association of Hospital and Administrative Pharmacists of Nigeria (AHAPN).

3.1 RESEARCH PHILOSOPHY

This research study is dictated by the philosophical paradigm of interpretivism. This paradigm with its naturalist methodology seeks to understand and interpret a phenomenon or reality within its real-life context (Saunders *et al.,* 2012). Thus, as a constructivist paradigm that sees reality as socially constructed, interpretivism presents a subjective epistemology and a relativist ontology typical of the qualitative research design intended for this study. The interpretivism philosophical paradigm is contrary to the positivism paradigm which emphasises an experimental methodology to determine measurable and generalizable outcomes of a reality (Punch, 2005). Consequently, positivism has objectivist epistemology; as such, it utilizes deductive reasoning to develop and test hypotheses to ascertain the causal relationship of variables (Creswell, 2003). Therefore, positivism typically guides a quantitative research design, thus, it seeks to derive numerical data for statistical analysis and interpretation.

The choice of interpretivism for this study is motivated by this researcher's desire for dialogical reasoning in order to stimulate the in-depth analysis of the case study. This is to enable this researcher to seek 'why' the problems exist and 'how' they can better be tackled or addressed. Therefore, the deployment of interpretivism for this study will enable

this researcher to generate contextual evidence that will not be possible utilizing positivism philosophy. Interpretivism is not at variance with investigating public health problems as it has been applied to various studies (Green & Thorogood, 2004; Hansen, 2006; Rolfe *et al*., 2018).

3.2 RESEARCH STRATEGY

A qualitative case study research design was engaged for this study as it aligns with the interpretivist philosophical paradigm. A qualitative case research design provides a framework for studying a reality in its natural context. According to Yin (2009), a case study is "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not evident.". Thus, a case study research design is capable of explaining causal links of outcomes of a policy, help identify possible gaps and provide solutions to refine it to be more effective (Green & Thorogood, 2004). This is in contrast with an experimental research design with its preoccupation with a randomised and controlled inquiry aiming to test a particular hypothesis for causality (Creswell, 2003). As such, the utilization of the case study research design in this study will enable this researcher derive insights in the form of detailed rich data that can help create a more robust knowledge of the subject matter. Thus, the case study research design can help test or develop a theory which, in turn, can form the basis of a future quantitative study to establish scientific rigorosity and generalization (Yin, 2009).

3.3 RESEARCH APPROACH

This study shall seek to utilise qualitative data to critically analyze the subject matter. Qualitative data are nonnumerical data that come in the form of text, audio-visual recordings or transcripts needed for in-depth analysis of a subject matter (Saunders *et al.*, 2012). Qualitative data can be generated through methods such as key informant interview, observation, focus group discussion (Punch, 2005). Therefore, the primary data needed for this study shall be derived from a key informant interview which is a qualitative

method of generating data from participants with first-hand or in-depth knowledge of a subject matter (Creswell, 2003). This can help generate new theories or improve existing theories to be more efficient. The Key informant interview has been generously used in public health (Cott *et al.*, 2016; McAlearney *et al.*, 2016). As such, an open-ended interview was carried out with 8 participants with expert knowledge and requisite experience in the distribution and dispensing of medicines with reference to medication errors and patients/consumers wellbeing.

3.4 KEY INFORMANT INTERVIEW FOR HEALTHCARE EXPERTS:

The key informant interview guide consists of two sections, section A for demographic information of the participants and section B to satisfy the aim of the research for the Nigeria Healthcare system response on drug distribution and medication administration errors. The demographic section which contained six (6) questions provided us with statistical representation of the participants for the study. Section B had nine (9) questions drawn from the research objectives, was designed to encourage the participants towards expressing their professional opinion without any form of interference or hesitation. The researcher consistently reminded the participants about the inclusion and exclusion criteria in order to gain their consent, credibility of the respondents of their responses and assured them of the safety of the data generated from the interview which will be managed by general data protection regulation (GDPR).

3.5 PRIMARY DATA COLLECTION

The adoption of the key informant interview for this study is aimed at having a robust understanding of the subject matter and possibly address gaps in extant literature in the context of Nigeria's public health system. Thus, the experts that will make up the key informants to be interviewed will be meticulously selected. In this regard, the non-probability sampling technique will be utilized. The non-probability sampling technique is not based on random selection but on the subjective assessment of the researcher (Hansen, 2006). This is intended to enable the researcher to derive respondents that meet predetermined criteria valuable to the inquiry.

In the case of this study, the participants are public health experts with hands-on experience and knowledge of medication errors in the context of drug distribution and dispensing in Nigeria. The participants were derived through a purposive non-probability sampling technique. Thus, the choice of a purposive sampling technique for this study is amenable to the qualitative focus of the interpretivist philosophical paradigm. This is essential to this researcher's intention to generate in-depth data critical to the case study.

3.6 SOURCE

Twelve (12) persons that include medical doctors, nurses, pharmacists were contacted from notable bodies such as: the Nigeria Medical Association (NMA), Pharmaceutical Society of Nigeria (PSN), Pharmacist Council of Nigeria (PCN), Nigeria, Nursing and Midwifery Council of Nigeria (NMCN), National Association of Resident Doctors of Nigeria (NARD), Healthcare Administrators Association of Nigeria (HAAN), Association of Hospital and Administrative Pharmacists of Nigeria (AHAPN) were initially contacted to participate in the interview as public health experts (Key informants/participants). They were selected based on their work experiences in public administered health facilities, knowledge and involvement with medication errors administration and membership with industry affiliated bodies and associations. The researcher sought to have twelve participants as it was a good sample size to have for this study and based on participant availability.

The participants were contacted via electronic mails with an introductory letter stating the objectives of the study, the medium on how the interview will be conducted and a consent form stating the ethical consideration, inclusion, and exclusion criteria.

However, seven of the participants gave their consents and participated in the open-ended key informant interview. The interviews sessions were conducted using Zoom conferencing application for each participant.

Interview Questions	Sources from Literatures
- Can the current institutional framework governing medication administration in Nigeria's public healthcare system effectively tackle medication errors**?** - What are the factors that present enormous challenges to medication administration and monitoring in Nigeria's public healthcare centres? - Does the people management policy in Nigeria's public healthcare system affect patient safety with regards to medication errors? - What are the gaps in the management of HCPs that may be accelerating the problems of medication errors? - Taking into consideration global best practices, how you describe the management of healthcare professionals (HCPs) in Nigeria's healthcare centres? - What are the strategies needed to address gaps in Nigeria's	Ajemigbitse *et al.* (2013) - An Assessment of the rate, types and severity of prescribing errors in a tertiary hospital in Southwestern Nigeria. Oshikoya *et al*. (2013) - Medication administration errors among paediatric nurses in Lagos public hospitals: an opinion survey. Arulogun *et al*. (2011) - Prescription errors prevalent in four units of a University Teaching Hospital in Nigeria. Ajemigbitse *et al.* (2013) - A qualitative study of causes of prescribing errors among junior medical doctors in a Nigeria in-patient setting. Ayorinde *et al.* (2019) - Perception and contributing factors to medication administration errors among nurses in Nigeria. Iloh *et al.* (2020) - Patient safety in a Resource-constrained Context: A cross-sectional study of experience, drivers, barriers and preventive measures for safety incidents and accidents amongst medical doctors in South-east Nigeria. Auta *et al.,* (2016) - Challenges to Clinical Pharmacy Practice in Nigerian Hospitals: A

medication administration with regards to medication errors and patient safety in the country's public healthcare system? - What are the lessons on the tackling of medication errors from other countries we can learn from? - What are the steps that would be needed to reimagined HCPs management to respond effectively in tackling medication errors in Nigeria's public healthcare centres? - What technology stacks would recommend and how can they be widely deployed to greatly reduce the problems of medication errors among HCPs?	Qualitative Exploration of Stakeholders' Views: Clinical Pharmacy Practice in Nigeria'. Agu *et al*. (2014) - The incidence and types of medication errors in patients receiving antiretroviral therapy in resource-constrained settings. Ogunleye *et al*. (2016) - Medication errors among health professionals in Nigeria: a national survey. International Journal of Risk & Safe Medicines. Oyekale (2017) - Assessment of primary health care facilities' service readiness in Nigeria. BMC Health Services Research. Ekama *et al*. (2019) - Medication Error among Healthcare Workers in a Major HIV Treatment Centre in Nigeria. Babatunde *et al*. (2016) - Prevalence and pattern of prescription errors in a Nigerian kidney hospital.

Open-ended key informant interview generated a great amount of data which was subjected to a multi-step analysis to streamline them. Accordingly, the audio-visual recording was transcribed into texts using Happy Scribe. The transcript was analysed for themes and patterns; as such, this researcher will painstakingly examine the interview transcripts multiple times to seek answers relevant to the research questions of the study. Coding was also applied to label themes and patterns which will be corroborated with the

quotations from the key informants. To ensure clarity and rigor in the data analysis, data generated was analysed against extant literature to strengthen research credibility.

3.7 ETHICAL ISSUES

To ensure a high ethical integrity for this study, the researcher made available an interview request letter to seek the participation of the key informants (participants) will cover the research objectives and the implications for the healthcare sector in Nigeria. They were also informed that the study was purely academic and the researcher requirement for his master's degree programme. It will be made known to the participants that no clinical experiment will be conducted in this study and that their information will be confidential with full non-disclosure.

The informed consent of the participants will be the starting point of the conversation. In this regard, the participants will be provided with a consent form indicating the aims and objectives of the study, the rights of participants, duration of data storage, and a statement indicating the researcher has no conflict of interest as the study is not sponsored by an organization and it is only intended for an academic study.

3.8 INCLUSION AND EXCLUSION CRITERIA

The researcher ensured that along with the cover letter requesting for the key informant interview, a consent form was included before proceeding which means it was at the discretion of the participants to either participate or rather withdraw. Thus, participation is voluntary and can be discontinued if a participant feels otherwise as participation is voluntary. The General Data Protection Regulation (GDPR) will be expressed to the participants to ensure the confidentiality of sensitive data while the presentation of data will be anonymised to remove identifiers.

3.9 CONCLUSION.

The research methodology and strategy indicated the overall process of the flow of the research for the given study. The qualitative approach employed provided positive responses from participants that allowed for better insights on the respondent's thoughts, positions, opinions and also better understanding of the research study. The data sources and data collection methods were used. The overall research strategies and framework are indicated in this research process from problem formulation to problem validation including all the parameters. As such, this chapter presents logical steps adopted in the detailed study of the subject of inquiry. The subsequent chapters highlight the results of the data analysis.

CHAPTER FOUR: FINDINGS AND ANALYSIS

4.1 Overview

The incidences of medication errors (MEs) represent perhaps the most widespread type of patient safety incidents in-hospital care and can be harmful to patients' safety, and also negatively impact the integrity and financial wellbeing of a health care institution. Therefore, the systematic reporting of errors is a vital responsibility as seen in the emergence of the International Medication Safety Network (IMSN). As such, this chapter presents the outcomes of the key informant interview conducted. These outcomes are analysed against extant literature for logicality.

The in-depth interviews of 7 experts with professional experience or knowledge of drug administration in Nigeria's hospital situations encompassed participants such as physicians, pharmacist, and nurses. While 12 invitations were sent out by this researcher, only 7 of them showed an interest to participate. Thus, in-depth interviews of 7 experts with professional experience and knowledge of drug administration in Nigeria's hospital situations was conducted via Zoom. The participants encompassed physicians, pharmacists, community health specialist and a nurse. The interviews were transcribed verbatim and analysed using thematic analysis. The participants consisted of 3 male and 4 female. The interview lasted between 25–42 minutes. The results were organized around:

1) The institutional framework governing medication administration in Nigeria's public healthcare system.

2) People management policy in Nigeria's public healthcare system with regards to medication error and patient safety

3) Strategies with the potentials to address gaps in Nigeria's medication administration to greatly reduce medication errors and improve patient safety in the country's public healthcare system.

4.2 PRESENTATION OF THE DEMOGRAPHIC DATA OF THE KEY INFORMANTS

Table 2: Participant Demographic Profile

Description of Participant	Participant 1:	**Public Health Physician**
	Participant 2:	**Pharmacist**
	Participant 3:	**Public Health Physician**
	Participant 4:	**Nurse**
	Participant 5:	**Community Health Specialist**
	Participant 6:	**Pharmacist**
	Participant 7	**Community Health Specialist**

DATA PRESENTATION

4.3 THE INSTITUTIONAL FRAMEWORK GOVERNING MEDICATION ADMINISTRATION IN NIGERIA'S PUBLIC HEALTHCARE SYSTEM.

The participants were unanimous in their submission that the institutional framework was weak and impacted by the broader systemic challenges confronting. The low level of government expenditure on improving healthcare and continued brain drain due to HCPs moving to rich nations of the world for employment were identified by the participants as major impediments.

(Participant 4)...public hospitals have suffered long-term neglect, the politicians do not use them...they go abroad for treatment, the neglect makes tackling MEs even more challenging...

According to the participants, Nigeria's healthcare system is overstretched and in urgent need of material and human resources to improve services to the people. However, the participants emphasised the benefits of the institutional framework governing medication administration in Nigeria.

They identified various institutional mechanisms for ensuring the rational administration of medication to the patient. The Clinical Audit report as part of the National Drug Formulary (NDF) was emphasized as a standard procedure that physicians prescribing medications have to abide with. The federal and state governments who provide public hospitals mandate physicians to follow the clinical audit guideline while making prescriptions. The Clinical audit guideline seeks to ensure systematic management of patient care against the treatment plan. According to the participants, effective adherence to the audit guideline will enable physicians to monitor drug administration and quickly make amends where an error has occurred. In turn, according to the participants in the use of supervision, audit and feedback to ensure the drug administration system is accountable. Thus, it includes mandatory incident reporting for all HCPs prescribing and administering medication to patients.

(Participant 7)....regular medication auditing is mandated by the FMOH and medical directors are mandated to enforce it...but again the effectiveness of an institutional framework or provision is dependent on its implementation...

It was stated that while Nigeria has laws governing drug distribution and sale, there exist no laws governing drug prescription and administration in hospital settings. Thus, there is no liability legislation that HCPs are accountable to. That does not mean HCPs cannot be sued for mismanaging a patient treatment plan using other provisions of the law; however, the absence of liability legislation has created a lacuna that may be festering the lack of accountability of HCPs.

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HCPs cannot be sued for mismanaging a patient treatment plan using other provisions of the law; however, the absence of liability legislation has created a lacuna that may be festering the lack of accountability of HCPs.

When asked about the factors that present enormous challenges to medication administration and monitoring in Nigeria's public healthcare setting, the participants had different but also complimentary pointers. Institutional weakness was identified by the participants for its overarching influence over the entire public healthcare system. Thus, they listed elements of institutional weaknesses such as inadequate funding, shortage of HCPs, poor supervision, non-adherence to standard procedure of medication reporting amongst others. Other factors listed were HCPs inexperience, lack of professionalism, and self-awareness.

When asked how these factors have affected the monitoring of medication error in Nigeria's public healthcare settings, the participants say it has undermined public confidence and compounded the issues of self-medication and quackery among HCPs. Due to the fear that people will not get adequate medical treatment at government hospitals forces many to seek private healthcare facilities. While those who cannot afford it, choose to self-medicate or patronize unregistered medical facilities for care. These hospitals, according to the unanimous position of the participants, are known to be run by HCPs without a license to practice.

(Participant 1)...in many rural communities I have worked, there is this few orthodox medical professionals...they tell you stories of how a family friend or brother got an injection and later died or how someone died treating malaria in the hospital...there is a great suspicion of formal health based on their personal experiences...

The participants were worried that the depth of medication errors is not known in Nigeria's public hospital settings. They contend that the patients are rarely aware of medication errors and in turn, HCPs rare report it in their daily incident report. Often than not, patients seeking healthcare in public hospitals do so because they lack the financial capacity to use private hospitals. It is not uncommon to see HCPs in government or publicly funded hospitals demonstrate a very low level of professionalism while attending to patients.

According to the participants, there is a pattern of complacency on the part of HCPs working in government-owned hospitals.

(Participant 4)....our publicly-funded hospitals have over the years deteriorated...misdiagnosis is a major problem and this contributes significantly to medication errors...

When asked about practices from other countries that can be replicated in Nigeria in the effective management of drug distribution and administration in public hospital settings, got mixed responses. Three of the seven participants thought that the existing framework is not low in quality but lacking in effective implementation. This participant felt that as much as the federal and state governments continue to commit to inadequate funding and top-heavy bureaucratic management of publicly funded hospitals, medication errors and other challenges will continue to fester. While the other four participants agreed to that position, they equally made a case for the use of technology as seen in other countries of the world. These participants argue that some publicly funded hospitals are managed effectively even with systemic challenges. Thus, in their opinion, the adoption of a digital medication administration system can help drastically reduce medication errors and also create a digital footprint that can be leveraged to monitor the clinical activities of HCPs.

The participants consider the benefits of the digital system as a suite of technology stack comprising prescribing ordering/dispensing, administration and post-administration of medication.

(Participant 6)....we have a public hospital setting serving a huge number of people...don't forget that our physician to patient ratio is one of the worst in the world...these physicians and nurses are overburdened; technology can be of help...

However, the participants were quick to point out that deploying digitisation equally requires training of HCPs on how to use the system. In turn, they recommended that the digital medication distribution and administration system will need to be managed by the private sector to be effective. This position taken is due to what they referred to as a culture of mismanagement that often manifests in Nigeria's public sector.

Table 3: summary of Themes and subthemes on institutional framework governing medication administration in Nigeria's public healthcare system.

Theme	Sub-theme	Quotes
Systemic inadequacies	Underfunding	*...the allocation to the healthcare sector undermines the ability of HCPs to effectively manage medication administration...HCPs are underpaid or owed salaries and demotivated. .it has also worsened the physician-patient ratio in the country...inadequate funding has led to outdated infrastructure and lack of automation leading a huge manual workload (Participant 1)*
	Weak Enforcement of Standard Procedures	*There is a weak culture of governance in many public hospitals and this is negatively affecting medication error reporting...HCPs go about not using simple tool such as incident report and they rarely get penalized because of a culture of cover up.(Participant 5)*
	Severe Shortage of HCPs	*:...our healthcare workers are overstretched and this is a major issue managing medication administration in quite a large number of public hospitals...they get tired or overburdened distribution and that can actually elicit plenty of*

		mistakes prescribing or administering a medication to a patient… (Participant 3)
	Weak legal provision:	*...physician liability is rare taken up due inadequate legal provision guiding medication administration in public hospitals...thus, it makes HCPs feel less accountable for their action as they rarely face litigation claims on the job... (Participant 2)*
Healthcare workers related factors	Attitudes of HCP	*…"The negative attitude of health workers towards medication error is a major obstacle in tackling the problem, I am not just talking about nurses and drug dispensing attendants but doctors, pharmacists and nurses as well. They often do not understand the ethical dilemma involved in the healthcare practice or choose to ignore it. This results to nonchalance towards patients and perpetuation of errors occurring"… (Participant 3)*
	Behaviours towards patients	*…"If you ask or interview the average Nigerian family, there is bound to be a story of a medical error especially medication error that had happen. The healthcare provider may have acted improperly*

		to them and the situation. Most families will have one tale or the other of their terrible experience relating to ME. The impact of medication errors cuts across the individual, family and the community,"… (Participant 2)

4.4 PEOPLE MANAGEMENT POLICY IN NIGERIA'S PUBLIC HEALTHCARE SYSTEM WITH REGARDS TO MEDICATION ERROR AND PATIENT SAFETY

This question was meant to ascertain the nature of human resource management in Nigeria's public hospital setting owing to the persistent allegations of a low level of professionalism amongst HCPs. When the participants were asked to describe the management of healthcare professionals (HCPs) in Nigeria's healthcare centres. Two of the participants felt that homogenous people management culture does not exist. As such, they described the culture of people management as a mixed bag. There are hospitals that the medical directors implement best HR practices such as regular staff training, payment of bonuses, payment of salary as of when due, good communication practices, provision of modern equipment, periodic performance audit and leadership support. The other five participants assert that HR management in public hospitals lacks best practices due to archaic management policy.

(Participant 7)...these hospitals don't have a dedicated HR management system, there is a central body in charge of recruitment and other HR functions and this is are the Federal and Civil Service Commissions... even the medical director running the hospital incapacitated to enforce discipline because it has been routed through the commission...

These five participants also said because of the systemic challenges confronting Nigeria's public healthcare institutions, adherence to beat HR practices only exist on paper and not in actual practice. They argue that public hospitals still a high rate of employee turnover,

attrition and burnout. The corporate culture is poor and the talk of best practice will be hard to establish if the government continue to pay lip service to the healthcare sector

When asked to identify the gaps that are currently undermining the management of HCPs and their possible implication on the problems of medication errors in a public healthcare setting in Nigeria, the participants could not agree more on the issues.

They listed lack of regular training, very low retention rate, poor communication, lack of a competitive wage structure, and severe financial constraints amongst others. These gaps, according to the participants continue to provide a fertile ground for medication errors to fester to the detriment of patient's wellbeing. A physician or nurse that is not exposed to regularly training puts the patient health at risk of medication error the participants assert. The endless cycle of industrial actions that bedevil public hospitals was also mentioned by the participants as one of the symptoms of a weak or poor HR regime. The participants said based on personal experiences either working or consulting for the public hospitals, the legacy HR architecture in a place represents a major impediment to quality service delivery. As such, a pattern of HCPs flouting standardized process of medication management. However, they acknowledged that globally, medical professionals are being over-worked even in HICs. What makes Nigeria's situation worse is the weak political will to invest in the healthcare sector.

(Participant 6).....we have one of the world's fastest-growing population, yet the development of key infrastructure such as healthcare remains only a political campaign slogan...

When asked to describe HCPs motivation and commitment in the public hospital setting, the participant's submissions had very few issues to disagree on. While five of the participants were particularly concern about the low level of engagement that characterises people management, two of the respondents argued flexibility does exist in the HR regimen and it is even being abused by the personnel. These two respondents reflected on their time working in a government hospital to express their reservations on the full extent of HR practices in public hospitals.

They asserted that on many occasions, HCPs deliberately abandons their responsibility or engage in other activities such as bringing merchandise to sell in the hospital. These are activities a private hospital will never cordon the two participants pointed out. The other five participants pointed out that the lack of professional discipline among staff members is symptomatic of the outdated HR management structure in place. These five participants noted that while some of the country's best physicians still work in government hospitals, they run a private practice that often commits more time than their primary employer the government. However, they pointed out that while medication errors are not tolerated, enforcement is weak and cover-up is rife. According to all the seven participants, a significant number of patients are not even aware of medication errors and because HCPs in government hospitals are unionized, plenty of incidents of medication errors go unreported to avert industrial unrest.

When asked about the steps needed to reimagined HR management to respond effectively in tackling medication errors in Nigeria's public healthcare centres, the respondents made several propositions that align in one way or the other. Some of the propositions highlighted are the need to run a decentralised HR management regime, the need to appoint a CEO or makes the office of medical director operate as a CEO, appoint an accountability office from the private sector to carry out a periodic HR audit in public hospitals, invest in automation, and improve funding to the sector. The participants were quick to point out that these propositions will amount to wishful thinking with the government whether at the federal or state level demonstrate the political will to enhance HR management in their hospitals.

According to the participants you need the government to commit to changes, a learning and development culture or a culture of accountability cannot reflect in the HRM of publicly owned hospitals with the chronic underfunding and mismanagement of financial resources that go unnoticed. Two of the participants retorted how do we expect a nurse that operates manually and attends to numerous patients and works sometimes up to 12hrs not to commit medication errors? According to the participants, these systemic problems have been effectively improving patient safety in Nigeria's public hospital settings.

Table 4: summary of Themes and subthemes on People management policy in Nigeria's public healthcare system with regards to medication error and patient safety

Theme	Sub-theme	Quotes
Highly Bureaucratized HR regime	Weak Corporate Culture:	*...there exists a terrible culture amongst public sector workers, including HCPs, that since the workplace is owned by the government, staff can remain unprofessional and still get paid at month end".(Participant 2)*
	Low Employee Engagement:	*...because we operate a heavily bureaucratized HRM in our hospitals and this continue to limit training and learning opportunities, compensation and benefits, work-life balance and organisational transparency critical to high employee engagement...a highly engaged workforce tend to be more productive than others less engaged...in a low employee engagement situation found in many public hospitals, mismanagement of patients treatment plan will remain a major problem" (Participant 1)*
	Low adherence to standard operating Procedures	*We have a system impacted by HR practice that is opaque and vulnerable to the unprofessional conduct of HCPs...medication errors are deliberately omitted in the daily*

		incident report or even covered up. In such a situation, low adherence to standard procedures tend to proliferate...(Participant 3)
	Brain drain	*There is a massive exit of HCPs due to the slow pace of improvement in HRM, and as rich countries experience shortages and talented HCPs from places like Nigeria are quick to recruited abroad...it is important to note that experienced and talented staff can help mitigate medication errors" (Participant 7).*

4.5. STRATEGIES WITH THE POTENTIALS TO ADDRESS GAPS IN NIGERIA'S MEDICATION ADMINISTRATION THAT CAN GREATLY REDUCE MEDICATION ERRORS AND IMPROVE PATIENT SAFETY IN THE COUNTRY'S PUBLIC HEALTHCARE SYSTEM.

When asked to identify strategies with the potentials to address gaps in Nigeria's medication administration that can help to greatly reduce medication errors and improve patient safety in the country's public healthcare system, the participants came up with numerous recommendations. The recommendations comprise public-private partnership in the form of Health Sector Development Program (HSDP), improved funding, reimagining of the HRM, boost HCPs education in public universities.

As regards to public-private partnership, the participants assert it can serve the purpose of introducing automation in the drug distribution and administration in the hospitals. They pointed out as an example, the partnership between Nigeria's Ministry of Finance and a private company in deploying integrated personnel and payroll information system (IPPIS) to manage payroll costs and budgeting. Thus, the participant suggested a suite of technology such as the electronic Health Management Information Systems (eHMIS) which can among other things strengthen the monitoring of drug administration in public hospital settings. According to the participant, this will help reduce the workload of HCPs who currently use manual procedures that are error prone.

(Participant 6)....countries such as Ethiopia, Rwanda, Botswana and South Africa have started working with eHMIS in stages...certainly it takes some time, resources and training to have a fully automate healthcare sector, but we just need start, we are in my opinion very slow"

However, the participants made it clear that the technology has to be managed by the private sector to ensure it does not end up as a white elephant project. The government must also be committed to providing counterpart funding for such a project the participants added. Thus, according to the participants, funding remains a recurring theme that cannot be relegated to the background in a robust attempt to enhance service delivery in Nigeria's public healthcare setting. Three of the participants argues that a public hospital with quality infrastructure and service delivery can diversify its operations

to make additional money needed to pay the private entity ruining its digital platform. Currently, government hospitals are seen as the cheapest source of healthcare and since they subsidized, it will be difficult for them to pay for services such as automation. According to the participants that is why public hospitals have to be run as a company and not a bureaucracy as they are currently. The CEO mentality has to be introduced into the system to make the hospitals much more productive and profit oriented since government funding has consistently remained inadequate.

Two other respondents had a contrary perspective, they argued that by making the public hospitals profit oriented will deny the poor of their major source of formal care. Instead, they advocated that government should set out special funds to accelerate digital adoption. Again, it was argued that a national health insurance scheme should be intensified. Thus, while the participants agree that private partnership.is important, they differ on how it should be implemented.

Also, the participants made a case for the reimagining of the HRM practices to demonstrate a greater capacity to ensure continued learning, career development and some level of work-life balance. According to the participants, the secondary and tertiary hospitals need to have distinctive HRM to attend to their individual needs. This is crucial to establishing best practices in the hospitals. An individual HRM will be quick to attend to specific needs, including recruitment and staff discipline. However, the participants equally pointed out that reimagining the HRM in the hospitals will not be easy as the unions are always suspicious of any move to alter the status quo ante. The current HRM policy, the participants argue, is incapable of improving the work culture and service delivery because of its weak impact on professionalism. The participants also suggested that HCPs education in the universities should be incentivised to encourage more young people to take up the profession. We are not producing many medical professionals and the school system can serve as a sustainable recruitment pipeline, the participants posited. In turn, the participants advise that Nigeria government should provide scholarship and tuition-free opportunities for young people to encourage recruitment into the hospital system.

When asked on ways to boost HCPs adherence to set down medication administration rules in Nigeria's public healthcare centres, the participants recommended a robust system of supervision. This is premised on the perspective that automation may still take some time before it is fully automated; as such, supervision has to be carried out vigorously to make sure HCPs who prescribe, dispense or administer medication do so with accountability and the fear that non-adherence to standard procedure will be met with a disciplinary action.

According to the participants, notwithstanding, the systemic problems confronting government run hospitals, HCPs have a responsibility to abide by all standard procedure of medication administration. Thus, HCPs have to report every incident of medication-errors and to ensure services rendered do not jeopardises the patient's health and where a medication error occurs, it is notified for proper and urgent attention. But, again, the participants contend that effective supervision is dependent on hiring more staff by the hospitals. The physician to patient-ratio is extremely wide, it will be difficult to ensure effective supervision in this instance if more qualified HCPs are employed to provide vital supervision.

On what to do address the severe issues of underfunding of public hospitals, the respondents expressed different perspectives. Two of the participants suggested that privatisation of the healthcare sector is long overdue. The other five participants rejected the idea of a privatisation to boost funding.

These five participants suggested that the government should demonstrate a strong political will by boosting funding and mandating accountability report from the management of the hospitals. Thus, they suggested a new governance structure for the hospital management to comprise members from both the private and public sectors to boost accountability. However, all the participants advised that the management should partner with corporate bodies to derive some of their CSR in cash or infrastructure development into the hospital.

***Table 5: summary of Themes and subthemes on* Strategies with the potentials to address gaps in Nigeria's medication administration and improve patient safety.**

Theme	Sub-theme	quotes
Reimagining of the Governance System	Public Private Partnership	*…the ministry of health at the federal and state levels need to reconstitute the governance board of public hospitals to include members of the private sector and not just bureaucrats...it will help boost accountability and help attract funding, expertise and infrastructure development grants from the organized private sectors (Participant 1)*
	More Funding	*"The government cannot continue to underfund the health sector and not see deterioration in the services rendered to the public...personnel cannot be going on frequent strikes due to uncompetitive salary package and medication errors will not be a significant issue" (Participant 7)*
	Automation	*an automated system will ensure greater accountability in medication administration...our HCPs are being overworked and they use manual procedures, automation can help to drastically reduce workload and mitigate medication errors in a timely manner"(Participant 6)*

	Learning and Development	*"We need to continuously update the skills of our medical personnel and this requires exposing them to training on best practices and skill development home and abroad...we have too many untrained personnel and you cannot rule out their contributions to medication errors...the government also need to incentivise enrolment in medical and nursing education to create a sustainable recruitment system" (Participant 2)*
	Experienced Hires	*"...our hospitals need to be attractive to attract and retain experienced and talented individuals who can exercise effective supervision over subordinates in the medication process...these individuals are required to enforce governance standards and also mentor subordinates on best practices...currently, they are few and we need to strive to hire more of them. " (Participant 5)*

4.6 DISCUSSION

This qualitative study examined the medication distribution and administration system in Nigeria's public hospital setting with a specific emphasis on medication errors. While medication errors represent a global health challenge, LMICs such as Nigeria are even more impacted due to broader development challenges that create severe inadequacies for the public healthcare sector.

Thus, the quality of the healthcare service delivery of public hospitals is crucially important to attaining universal health coverage as part of a nation's commitment to the UN's SDGs. Gleaned from the participants' submissions is that medication errors are pervasive in Nigeria's public hospital settings. This position had also reflected in other studies which found that medication errors represent a fundamental situation in-hospital care and capable of causing harm to patients (Ogunleye, *et al,* 2016; WHO, 2017).

The data derived from the participants indicate that the institutional framework governing medication administration in Nigeria’s public healthcare system is enmeshed in bureaucratic inaction. Thus, even as the National Drug Formulary (NDF) mandates periodic clinical audit report and daily incident report, public hospitals go about their activities without much regard to adherence. As such, enforcement is weak and this may be hiding the depth of medication errors in public hospitals in Nigeria. Systemic inadequacies such as severe underfunding of the sector, crumbling infrastructure, widespread use of manual procedures, and the wide physician to patient ratio were listed as significant barriers to the NDF.

The results aligned with similar studies which found that Nigeria's public hospital settings are significantly impacted by error-prone manual processes, staff burnout, frequent industrial actions, extremely low digital inputs, weak supervision (Cohen & Smetzer, 2017; Ekama *et al.*, 2019). These problems constitute an impediment to effective monitoring of medication administration and with severe consequences for in-patient care. However, a medication error reporting is mandatory for all HCPs; as such, it is a disciplinary offence not to do so. But in many instances, its only exists on paper, its practical implementation is lacking. The patients are mostly unaware of its existence and rarely has any litigation claim been brought against medical personnel and the employer. According to the study

of Iloh *et al.*, (2020), because few patients even know the term medication errors, the physicians or nurses do not bother to report it or brief the patient that a medication error has occurred. This unawareness does affect patients that are educated but it is more widespread among poor and lowly educated members of society. The public hospitals are mostly patronized by the people who cannot afford private care since out pocket expenditure still pervades Nigeria's healthcare services. Studies have argued that the HCPs are working in a difficult situation and their employer should bear the blame for creating a stressful workplace (Ayorinde & Alabi, 2019).

Others have argued that HCPs working in government hospitals exploit the poor work culture to demonstrate negative work attitude (Ajemigbitse *et al.,* 2013; Oyekale, 2017). They listed instances where HCPs especially physicians and nurses taking up private employment while working in government hospitals. The studies found it is an open secret as some physicians are known to direct patients from the government hospitals they work to their private hospitals. Sometimes they direct patients to go and purchase drugs at a specific pharmacy own by the physician, pharmacist or nurse and a receipt must be submitted to indicate the pharmacy was patronized. While these unprofessional conducts can earn the HCP a suspension or be fired from his or her position, the compromised enforcement regime meant it is easier said than done. Thus, beyond the systemic inadequacies, the individual professional attitude of HCPs needs an urgent reorientation.

It then raises the question of people management policy in Nigeria’s public healthcare system with regards to medication error and patient safety. The participants suggested it is archaic and needs to be reimagined for better outcomes. This was also stated in the study Ayorinde & Alabi (2019) conducted which indicates HRM in public hospitals is bureaucratized and having little effect on professional development. In another study by Oyekale (2017), there exists a culture of lack of commitment in public hospitals and the professional attitude of HCPs especially nurses whose lack of professionalism continue to threaten the wellbeing of patients. According to Ogunleye *et al*. (2016) and Oshikoya *et al.* (2013), nurses perform most of the medication administration and often under-report or deliberately omit medication errors. The public hospitals operate a centralized personnel administration system that is ineffective in a fast and digitalized world. While

the participants made a case for decentralized personnel administrative system in the form of an HRM department in each secondary and tertiary hospital, the slow pace of change in public institutions represents a barrier (Oshikoya *et al.*, 2013). According to Ekama *et al.*, (2019) there exists a pattern of indifference among HCPs in government hospitals and this negatively impact the monitoring of medication administration. Thus, this type of corporate culture allows medication errors to fester in public hospitals as supervision is weak and abuse of standard operating behaviour rife. The modern HRM system emphasizes professional training of HCPs to abide by standard procedures and patients' right to know when a medication error has occurred. According to Babatunde *et al.* (2016), HCPs are human beings and as such are vulnerable to mistakes such as medication errors; however, when such occurs are widespread, HCPs need to demonstrate the professional responsibility to report them and also inform the patient for quick remedy of the situation. To this, end, the participants made a case for strategies with potentials to address gaps in Nigeria's medication administration to greatly reduce medication errors and improve patient safety. These strategies consist of a new governance structure, funding, hiring of more experienced HCPs, learning and development, automation, and patient awareness.

Studies have shown that the governance structure of public hospitals is bureaucratized and incapable of ensuring best practices at all times. Thus, the participants recommended that the governance board incorporate selected members of the organized private sector can be very helpful in enhancing accountability in public hospitals. It just likes the boards of banks and other publicly quoted companies made up of individuals that have excelled in their various fields of endeavours. These individuals bring in expertise and clout to help develop an organization. Such a governance board is required to deepen a strong corporate governance regime in public hospitals. The impact of such a new approach can have a far-reaching effect on the professionalism of HCPs handling medication administration and the errors that may arise.

Other studies have suggested that inadequate funding remain a significant problem in medication administration. This is because it has hampered the public hospitals' ability to

hire more professionals, adopt automation and subject their personnel to continued training and development.

Ogunleye *et al,* (2016) argues that the use of automation will help HCPs to greatly reduce their work and quickly locate medication errors before it becomes an adverse drug event with capacity for morbidity and mortality. In another study by Ekama *et al.* (2019), the author suggested that digital automation is a modern tool that Nigeria's government needs to commit resources aside from the continued learning and development of HCPs. Due to a severe shortage of experienced HCPs to guarantee effective supervision, medication errors have become rife among junior physicians and nurses. According to the study of Iloh *et al.* (2020) focusing on public hospitals in SouthEast Nigeria, found that lack of training and inexperience of nurses led to a high rate of medication errors.

Patient awareness is also important in reducing the incidents of medication errors in Nigeria's public hospitals. Ayorinde & Alabi (2019) argues that when the HCP knows that patient the awareness level of the patient is high and can even litigate for claims against medical malpractice, physical or psychological damages caused by medication errors, the HCP will be more careful and eager to abide with standard procedure. In turn, this will require all public hospitals to attach to the patient treatment plan a medication awareness booklet to spell out patients' rights.

4.7 CONCLUSION

This chapter highlights the outcome of the analysis of the primary data generated from the in-depth interview conducted with 7 experts with knowledge about medication administration in Nigeria's public hospital setting. The outcomes were organized against extant literature which suggests an alignment. However, some of the recommendations made by the participants were not found in extant literature review; as such, they can help fill the gaps in the literature review. The reconstitution of the governance board, decentralisation of HRM practices and the introduction of a patient awareness booklet advised by the participants can help fill the gaps identified in the extant literature.

CHAPTER FIVE: RESEARCH CONCLUSION

5.1 THEORECTICAL CONTRIBUTIONS

In line with its qualitative objectives, this study engaged 7 participants with expert knowledge of medication administration in Nigeria's public healthcare settings. The seven experts were interviewed and the primary data generated were examined against the research questions developed for the study. The research questions are illustrated thus:

1- Can the current institutional framework governing medication administration in Nigeria's public healthcare system effectively address medication errors?

   The analysis of the primary data generated from the participants indicate that while the institutional framework is in accordance to WHO standard, enforcement of the National Drug Formulary (NDF) is encumbered by broader systemic challenges that have made public hospital settings vulnerable to the incidents of high medication errors (Ayorinde & Alabi, 2019). These systemic challenges include but not limited to weak corporate governance, inadequate funding, low employee engagement, weak supervision, and disregard for standard procedure. These factors were also reflected in the studies of (Cohen & Smetzer, 2017; Ekama *et al.*, 2019) which found that Nigeria's public hospital setting are undermined by crumbling infrastructure, overworked personnel, severe funding shortfalls, and a pattern of cover up. Thus, the institutional framework is rarely enforced and it is crucially important the factors underscoring its ineffectiveness are addressed.

2- Does the people management policy in Nigeria's public healthcare system affect patient safety with regards to medication errors?

   Patient safety is paramount to the integrity of a healthcare institution and where medication errors are rife, the HCPs who commit most of them needs to be critically evaluated to ascertain why its proliferation. The participants described personnel administration in Nigeria's public hospital setting as archaic and incapable of stimulating best practices and the highest level of professionalism. Accordingly,

the participants contend it is impeding the effective management of medication administration.

This position was highlighted in the study of Iloh *et al.* (2020) which suggest that the bureaucratized system operated in public hospitals exposes it to abuse and non-adherence to standard principles by HCPs. Thus, professionalism has been noted to be very low among HCPs in government hospitals, so also is the lack of accountability as incidents of medication errors are intentionally omitted from the incident's reports. In such a situation, the problems of medication errors may be more severe and widespread as currently known. Therefore, the cruciality of reimagining the personnel administration system to a modern HRM in order to create a culture of accountability and best practices.

3- What are the strategies needed to address gaps in Nigeria's medication administration with regards to medication errors and patient safety in the country's public healthcare system?

Studies (Ajemigbitse *et al.,* 2013; Oyekale, 2017) have established that fundamental challenges exist in Nigeria's public hospitals medication distribution and administration system. These challenges significantly contribute to the incident of medication errors with detrimental consequences on a patient wellbeing. The participants put forward new policy drive or strategies aside the known prescription such as improvement in funding, training, automation and better supervision that have been stated in previous studies.

Thus, the participants made a case for the reconstitution of the governance board of public hospitals in Nigeria to include non-bureaucrats and politicians such as individuals that have demonstrated integrity and leadership in the corporate sector. Also, advised was the need to decentralize personnel management to make individual hospitals effectively address their needs assessment. In addition, patient awareness booklet has become necessary to ensure greater accountability of HCPs in a patient treatment plan.

In view of the above, this study establishes outcomes that can serve the theoretical and practical needs of Nigeria's public hospital settings. This is underscored by the researcher's analyses of the primary data against the secondary data. This, in turn, has enabled this study to fill the gaps in the previous studies. Even more so, it underlined the need for a robust attention to the problems of medication errors in Nigeria's hospital settings.

5.2 CONCLUDING THOUGHTS

5.2.1 CONTRIBUTIONS AND IMPLICATIONS FOR MEDICATION ADMINISTRATION

Multiplication of roles, shortage of personnel, work related Interruptions that arise during the dispensing and administration of medications contributes considerable workload for healthcare professionals in public hospitals and health facilities. Medication error administration process that encourages a double-checking system before administration to the patients may minimize delays which interruptions, which encourage more analysis. Personnel need to be trained on good time management so has to have the ability to maximize the usable time per patient by minimizing socialization with other health personnel or interruptions from non-patients. Professionalism and work ethics that includes reporting medication errors must be enshrined in the hospital setting thereby encouraging a culture of medication accountability and patient safety.

5.2.2 LIMITATIONS OF THE RESEARCH.

This study like any other research endeavours has some limitations. In this case, the limitations may be found in the small size and risk of qualitative data exhibiting participants biases. Diverse opinions of a participant who failed to answer some questions could have affected the outcomes of the research.

The vast number of public hospitals in Nigeria may consider the findings of the study too narrow to address the situations in each of them notwithstanding the participants have had professional experience working in government hospitals.

Again, the subjective nature of qualitative study faces the risk of data inaccuracies such as misconstruing what a participant meant.

However, the limitations may be addressed in future studies seeking a more elaborate and generalizable findings. Such studies can utilise a mixed-method approach to triangulated data analysis to accomplish a more logical conclusion.

5.3 RECOMMENDATIONS

Nigeria's federal and state governments should demonstrate the political will by investing in the adoption of an electronic Health Management Information Systems (eHMIS) to help monitor even in real-time medication distribution and administration in public hospitals. This platform will replace the error prone manual process in use, and it should be managed by the private sector while HCPs are trained and regularly updated to master its application. The public setting in Nigeria has a terrible legacy of a low maintenance culture; thus, the automated platform needs to be maintained and managed by the private sector to have a significant effect on tackling the incident of medication errors.

Secondly, the government at all levels equally has to boost funding to the health care sector to help address the incessant issue of industrial actions caused by inadequate remuneration. It will help address crumbling infrastructure and help address acute shortage in the number of experienced and skilled HCPs. Thus, a boost in finding will help relieve the workload and tiredness that have been attributed to HCPs. This increase funding should also be allocated to medical and nursing education to encourage many more young people to join the profession and, in turn, help establish a vital recruitment pipeline.

Thirdly, the governance boards of the hospitals should be reorganized to include non-bureaucrats and politicians. The Nigeria government need to seek the active participation

of individuals from the organized private sector to join the boards. These individuals can use their clouts to attract private sector investment in the infrastructure development of the hospitals. They can also introduce best practices into the governance structure to boost accountability and transparency. These are needed to greatly reduce the incident of medication errors in Nigeria's hospital settings.

Fourthly, the personnel management system also needs to be decentralized and replaced with HRM to introduce a new work culture of accountability and the highest level of professionalism. Individual HRM will quickly address improvement needs and help improve HCPs engagement. Regular training and development, performance appraisal, and adherence to standard procedures are briefs HRM will pursue with zeal to tackle medication errors and enhance patient safety.

The government through its Ministry of health and regulatory agencies should also introduce patient awareness booklet as a component of a patient treatment plan. This is because the lack of awareness of medication errors by patients is also contributing to HCPs intentional omission of medication error in the daily incidents report. However, a public that demonstrates a high level of awareness can make a HCP forego the idea of non-disclosure knowing such can attract litigation claims. Therefore, patient awareness booklet should be given to patients in government hospitals, and it should have copies in the indigenous languages.

The federal and states ministry of health should also hire or engage private companies or consultants to carry out periodic clinical audit of its public administered hospitals to ascertain whether or not standard procedures are being adhered to. The need for a private company is to guide against conflict of interest that characterise the activities of bureaucrats checking on other bureaucrats. As such, private company with expertise in public healthcare should be contracted to periodically monitor all the activities of government hospitals as this will give a boost to medication administration accountability.

Further research need to be done that should include patients and auxiliary care givers whom represent as important stakeholders in MAE to investigate the effectiveness and efficiency of medication administration guidelines and system put in place. Additionally, healthcare professionals such as doctors, pharmacists and nurses in the private health

sector should also be studied and identified independently and not categorized as single healthcare professionals along with those working in public administered hospitals and health facilities. These sample population should be compared with non-healthcare personnel in determining the attitudes towards medication administration errors. This is quite important as healthcare professionals get a lot of feedbacks on the quality and level of satisfaction obtained from patients on their services. They will therefore be very helpful in making more accurate evaluations on the quality of healthcare services administered in both public and private hospital settings. In addition, studies need to be carried out on administrators and management personnel of healthcare centres to determine their perception and the challenges they face towards enshrining fully efficient medication administration process in their respective hospitals or healthcare facilities.

5.4 FINAL CONCLUSIONS

In concluding analysis of drug distribution and medication errors to improve pharmaceutical services in Nigeria, with the aid of extant literatures the researcher was able gain a better understanding of the topic which was very useful and valuable towards filling the gaps when engaging the identified experts, learning from their viewpoints and perspectives on factors associated with drug dispensing and medication error administration in Nigeria.

As deduced from the literature assessment, that factors influencing the occurrence of medication errors is relational to low investment of government in healthcare provision at all levels. It revealed also that medication errors is a global menace that is prevalent in developed and developing countries with some governments and relevant bodies taking an active role towards mitigating it in their respective countries. It also identified factors such as institutional inadequacies, under funding, Weak Enforcement of Standard Procedures, severe shortage of healthcare professionals, low educational and awareness campaign against self-diagnosis and medication etc.

The researcher concludes that the implementation of recommendations made by government at all levels in Nigeria through its ministry or department for health along with

other government regulatory agencies can aid in establishing an effective culture of medication administration in public health facilities and centres. Investment in personnel in terms of renumeration, training and disciplinary measures for healthcare practitioners should also be encouraged as well.

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