EVALUATING THE DRUG THERAPY PROBLEM DOCUMENTED BY CLINICAL PHARMACIST IN A HOSPITAL SETTING

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A PROJECT SUBMITTED TO THE DEPARTMENT OF CLINICAL PHARMACY AND PHARMACY PRACTICE IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF DOCTOR OF PHARMACY (PHARM.D) DEGREE OF THE UNIVERSITY OF BENIN, BENIN-CITY, EDO STATE

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CERTIFICATION

This is to certify that this project work was carried out by **CHIDUBEM JOSHUA AKPO**, with matriculation number **PHA1705996** in the Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, University of Benin, Benin-City, in partial fulfillment of the requirement for the award of Doctor of Pharmacy (Pharm. D) degree.

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DEDICATION

This piece of work is dedicated to my loving parents: Mr. and Mrs. James Nnanna Akpo.

ACKNOWLEDGEMENT

My profound gratitude goes to God almighty who through his love and mercy made it possible that I would be here. “To God be the glory, great things He has done”. I am grateful to God for life, good health, a sound mind, strength to complete this work.

I sincerely thank my parents, Mr. and Mrs. James Akpo, for their love and support. Writing a few sentences is not enough to acknowledge the sacrifices you’ve made for my sake. Thank you for teaching me that nothing is impossible to achieve.

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ABSTRACT

Background: Drug therapy problems (DTPs) are a major healthcare challenge which are associated with increased cost of treatment, misdiagnosis, increased length of hospitalization, decreased patient satisfaction with care and increased morbidity and mortality. Pharmacists play a crucial role in optimising medication use and improving patient outcomes within hospitals. Their clinical interventions span medication reconciliation, drug-drug interaction identification, dosage adjustments, and therapeutic optimisation. However, the extent and impact of these interventions often remain undocumented, hindering both individual pharmacist accountability and the evaluation of pharmacy services on patient care.

Objectives: The primary objective of this study is to evaluate the drug therapy problem documented by clinical pharmacists at the University of Benin Teaching Hospital (UBTH), Benin between April 2015 and April 2024.

Method: This is a retrospective cross-sectional study conducted in thirteen pharmacy departments of the University of Benin Teaching Hospital (UBTH), Benin. All DTPs identified and interventions made by clinical pharmacists evidenced by documentation were extracted. Descriptive statistics were used for the analysis of clinical pharmacist interventions. The prescribers' acceptance rate of the pharmacists' recommendation on the identified drug therapy problem was calculated by dividing the number of accepted interventions by the total number of interventions and then multiplying by 100.

Result: A total of 986 drug therapy problems were identified during the study with 48.17% of them being identified in 2023 as compared to 0% drug therapy problems in 2017. Between 2015 and 2020, only 189 DTPs were documented across the various pharmacy departments. COPD-NHIS documented the most DTPs with 135 drug therapy problems representing 13.7%

of the total DTPs documented while Main Theatre pharmacy recorded the fewest DTPs, accounting for only 1.4% (14) of the DTPs. Dosage too high is the most prevalent DTP occurring 363 times representing 36.8% whereas inappropriate adherence is the least prevalent occurring 15 times and accounting for 1.5% of the DTPs. About 22.2% (219) of these interventions were directed towards paediatrics (below 12 years) and 31.7% (313) to adults (>19 years). Antibiotics were the most affected drug occurring 249 times accounting for 25.1% of the drugs affected. It's closely followed by antihypertensives occurring 103 representing 10.4% and closely followed by centrally acting drugs with 91 occurrences accounting for 9.2% of the drugs affected. About 22.1% (218) of the interventions were directed towards the males and 29.0% (286) towards the females. Of the 986 DTPs recorded, the prescribers were contacted 851 times and they accepted 847 pharmacists' recommendations.

Conclusion: Over a decade, the documented drug therapy problems (DTPs) were surprisingly low for a major teaching hospital. A review of the recorded DTPs revealed a notable proportion occurred in females, while a smaller proportion affected males, and a significant number lacked gender documentation. A significant proportion of the interventions were focused on pediatric patients under 12 years old, while a notable proportion was directed toward adults over 19 years old. All 7 classes of DTPs were represented with a dosage too high being the most prevalent DTP while inappropriate adherence is the least prevalent. All drug therapy problems recorded were resolved. The prescribers demonstrated a remarkably high acceptance rate of the pharmacists' recommendations for the identified drug therapy problem, with nearly all suggested interventions being implemented, indicating a strong collaborative approach to addressing drug therapy problems.

Keywords: Clinical pharmacist intervention, documentation, drug therapy problem, hospital setting.

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CHAPTER ONE

INTRODUCTION

1.1 Background of Study

The last four decades have seen a slow but significant expansion of pharmacy practice across the world's healthcare systems (Geer et al., 2011). Pharmacy practice has evolved, new roles have been introduced and some roles have changed. At the pharmaceutical level of pharmacy, there has been a shift from a product-oriented to a patient-oriented approach, which emphasizes the shared responsibility of patients and pharmacists for the best possible results of their drug therapy (Ghada, 2008). Traditionally, the image of a pharmacist evokes visions of dispensing medication behind a counter. However, pharmacists are gradually expanding their professional role and shifting their attention from passive dispensing of medications to active care of their patients, patient advisors, health educators and collaborative clinical practice. Over many years, this change in focus had varying degrees of success and intensity (Hooper R et al., 2009). Beyond dispensing medications, pharmacists act as detectives, reviewing prescriptions for possible drug therapy problems, such as Drug interactions or incorrect dosage. They adapt medication plans to individual needs and ensure compatibility with existing treatments. They become educators and provide patients with knowledge about their medications and possible side effects. These new roles as the profession evolved led to what we refer to as clinical intervention.

A drug therapy problem (DTP) is broadly defined as “an event or circumstance associated with a drug treatment that actually or potentially interferes with the optimal outcome of the patient's medical care,” and is broadly associated with errors, side effects, or problems with the drug therapy adherence. DTPs are a common cause of morbidity, hospitalizations, and mortality and are considered preventable. An Australian review of adverse drug reactions and medication errors found that 2-3% of all hospital admissions were medication-related and 75% of these

were potentially preventable. A survey of ambulatory care patients found that approximately 25% had experienced DTP, with approximately 39% considered preventable (Peterson et al. 2007) (Ghandhi et al. 2003). A clinical intervention can be defined as “any professional activity carried out by the pharmacist”. “They aim to improve the quality of medication use and lead to a recommendation for a change in medication therapy, the method of administration or the patient’s medication-taking behaviour” (Peterson et al. 2007). It can also be referred to as the process by which a pharmacist identifies a potential medication problem and makes a recommendation to prevent or resolve the medication problem. A pharmacist's intervention includes all activities related to the safe use of medications and optimizing therapeutic outcomes for patients in collaboration with other healthcare professionals, ultimately improving patients (Kim and Schepers 2003), Dooley et al 2005). Clinical interventions are intended to complement other professional services such as pharmacy medication check services, staggered care, home medication assessments, inpatient medication management assessments, pharmacist immunization services and the provision of dose administration aids (Pharmaceutical Society of Australia, 2018).

1.2 Literature Review

Pharmacist-led interventions have emerged as a cornerstone for improving patient outcomes in the healthcare system (Ahmed et al. 2021). As drug professionals, pharmacists are in a unique position to make a significant contribution to patient care by identifying and addressing drug therapy problems. Pharmacists can optimize medication therapy, ensure appropriate medication use, and prevent adverse drug reactions. By actively engaging with patients, providing advice and collaborating with other healthcare professionals, pharmacists contribute to a holistic approach to healthcare. Studies have shown that pharmacist involvement in patient care, along with proper documentation, is associated with improved medication adherence,

fewer adverse drug events, and better overall health outcomes (Gillespie et al. 2009, Machado et al. 2007). Integrating pharmacists into clinical care teams represents a transformative approach to healthcare and leverages pharmacists' unique skills to optimize patient care. Pharmacists bring expertise in medication management, drug interactions, and therapeutic outcomes, making their involvement in clinical care teams critical to comprehensive patient care. By actively assessing prescriptions, consultations and care planning, pharmacists can contribute valuable insights that improve the decision-making process and ensure the safe and effective use of medications. In the ever-evolving healthcare landscape, consideration of cost efficiency and resource utilization is paramount. As drug professionals, pharmacists play a critical role in preventing medication-related complications, optimizing medication therapy, and promoting medication adherence. By actively participating in patient care, pharmacists contribute to improved health outcomes and potentially reduce the need for hospitalizations and emergency room visits. Additionally, by preventing emergency room visits and hospital readmissions through proactive medication management, pharmacists can play a critical role in minimizing healthcare costs associated with acute care settings. By conducting a comprehensive analysis of pharmacist-led interventions, this study attempts to quantify improvements in patient safety, medication adherence, and overall health outcomes. Through careful examination of patient data, the research aims to demonstrate how pharmacist involvement can lead to fewer medication errors, minimized side effects and improved patient care.

Classification of drug therapy problems

Cipolle/Morley/Strand used the term “drug therapy problem” instead. as a “drug problem”. Published in 1999, this concept generally refers to a systems approach that considers problems throughout the drug therapy chain from the patient's perspective. The classification is used in

many hospitals as well as community pharmacies in the USA to evaluate the activities of pharmacists in their daily provision of pharmaceutical care. In this classification Strand et al (1990) and Cipolle et al (1998) classified DTPs as follows:

Table 1.0 Drug Therapy Problems

Drug therapy involved	Type of drug therapy problem	Rationale
Indication	Unnecessary drug therapy	No medical condition Duplicate therapy Non-drug therapy indicated Treating avoidable ADR
	Needs additional therapy	Untreated condition Preventive or prophylactic Synergistic or potentiating
Effectiveness	Wrong drug	More effective drug available Condition refractory to drug Dosage forms inappropriate Not effective for condition
	Dosage too low	Wrong dose Frequency inappropriate Duration inappropriate Drug interaction
Safety	Adverse drug reaction	Undesirable effect Unsafe drug for patient Contraindication present Allergic reaction Dose changed too quickly
	Dosage too high	Wrong dose Frequency inappropriate Duration inappropriate Incorrect administration Drug interaction
Adherence	Non-adherence	Directions not understood Patient prefer not to take Patient forgets to take Drug product too expensive Cannot swallow/administer Drug product not available

(Source: Gobezie 2014)

Scope Of Clinical Pharmacists' Led Intervention

The scope of clinical interventions conducted by pharmacists has evolved to encompass a wide range of patient-centred activities aimed at optimizing medication therapy and improving health outcomes. Clinical interventions by pharmacists extend beyond traditional dispensing roles and involve proactive engagement in the medication use process, collaboration with healthcare teams, and direct interactions with patients (American College of Clinical Pharmacy 2008). Pharmacists now play a vital role in;

1. Medication management and Dosage adjustment: where they monitor and optimize medication regimens to ensure efficacy, safety, and adherence collaborating with prescribers to adjust medications based on patient response and clinical outcomes. This entails modifying medication dosages based on individual patient factors, therapeutic goals, and response to treatment thereby optimizing therapeutic outcomes while minimizing the risk of adverse effects. Pharmacists may adjust medication dosages based on patient-specific factors such as age, weight, renal function, and therapeutic response. Dosage adjustments aim to optimize the effectiveness of drug therapy while minimizing the risk of adverse effects.

2. Therapeutic monitoring and disease state management: Clinical pharmacists regularly assess patients for therapeutic responses and potential adverse effects utilizing laboratory data and patient assessments to adjust medication regimens as needed. Engaging in the management of chronic diseases through medication optimization and lifestyle counselling and also collaborating with other healthcare professionals to achieve disease-specific therapeutic goals.

3. Medication reconciliation: This is the systematic process of obtaining and maintaining an accurate and up-to-date list of a patient's current medications which serves the

purpose of preventing medication errors, ensuring patient safety, and improving continuity of care during transitions. Medication reconciliation involves reviewing a patient's current medication regimen, comparing it to previous regimens, and addressing discrepancies to ensure accurate and safe medication use. The pharmacist conducts comprehensive reviews of patients' medication profiles during care transitions to identify and resolve discrepancies ensuring accurate and up-to-date medication lists to prevent adverse events and enhance patient safety.

4. Patient education and Counselling: This is the provision of information and guidance to patients regarding their medications, including proper administration, potential side effects, and the importance of adherence enhancing patient understanding, promoting adherence, and empowering patients to actively participate in their care. Counselling involves providing information to patients about their medications, including proper administration, potential side effects, and the importance of adherence. Pharmacists' counselling efforts contribute to improved patient understanding and engagement in their treatment plans. Pharmacists now provide education to patients on medication regimens, including dosage instructions, potential side effects, and the importance of adherence and also offer lifestyle counselling to support overall health and wellness.

Categorizing these interventions provides insight into the multifaceted role of pharmacists in patient care.

Challenges and barriers to clinical pharmacist led interventions and documentation

These challenges and obstacles highlight the complex landscape pharmacists navigate when attempting to deliver clinical interventions. Identifying and addressing these barriers is critical to successfully integrating pharmacist-led services into comprehensive patient care models. Hepler and Strand's ground-breaking work on pharmaceutical care highlights the challenge

pharmacists face in balancing the demands of their workload with the need to provide comprehensive patient care. Time constraints and workload pressures can hinder the delivery of large-scale clinical interventions and impact the depth and frequency of pharmacist-led services (Hepler and Strand, 1990). The study by Mossialos et al. on the Changing Roles of Community Pharmacists highlights the resistance pharmacists may face from other healthcare providers if they expand their responsibilities. The resistance may be due to traditional perceptions of the role of the pharmacist, making it crucial to address the challenges of interprofessional collaboration to optimize patient care (Mossialos et al. 2015). Pharmacists' self-perceptions highlight the impact of scope of practice restrictions on pharmacists' professional identity. Limited autonomy in prescribing and other clinical activities may hinder the full implementation of pharmacist-led interventions and impair their ability to make a greater contribution to patient care (Rosenthal et al., 2010). A research work by Pellegrino et al. on Medication Therapy Management Services (MTM) addresses financial and reimbursement challenges. The study highlights the importance of addressing reimbursement models to sustain pharmacist-led interventions. The lack of financial incentives may hinder the widespread adoption of MTM services (Pellegrino et al. 2009). Hatah et al. concluded that integrating technology into pharmacy practice requires overcoming challenges such as access, training and infrastructure to enable efficient and effective interventions (Hatah et al. 2017). The study by Makowsky et al. “Using the theory of innovation diffusion”, sheds light on the challenges associated with interprofessional collaboration. The slow adoption of prescribing practices by pharmacists may be influenced by the need for effective collaboration with other healthcare professionals. Reducing these barriers is essential for the successful integration of pharmacist-led interventions (Makowsky et al. 2009). Additionally, patient resistance and lack of awareness of the expanded role of pharmacists may hinder the successful implementation of pharmacist-led interventions. Consideration of these factors is critical to patient acceptance and

engagement in pharmaceutical care. In Africa and Asia, lack of guidelines, poor leadership support, shortage of staff, lack of financial incentives in professional training, inadequate clinical and communication skills, dominance and resistance from doctors, lack of self-confidence, assertiveness, negative attitude, etc. are barriers to pharmacists' attitude towards the pharmaceutical care (Kamal et al. 2022), (Penm et al. 2014), (Bilial et al. 2017). Mekonnen et al. (2018), in their work in Ethiopia, identified six areas that influence hospital pharmacists' engagement in medication safety activities. Knowledge, skills, environmental context and resources, motivations and goals, social influences and social/professional role were some of these areas. The majority of hospital pharmacists reported that they were competent enough to recognize medication-related problems, but others felt that there were knowledge gaps and a lack of training and supportive skills. The majority of participants were very happy about their expanded roles and were optimistic about the future of the profession; However, barriers to service delivery included conflicting priorities, lack of funding and ignorance of other health professionals about the role of the profession. Pharmacists' clinical practice is also likely to be affected by several resource constraints, including staffing, infrastructure, government funding, and pharmacist acceptance rates of challenges respondents face when implementing drug safety measures. Acheampong et al stated that respondents (pharmacists) cited challenges as insufficient time (62.7%), most of their time spent on managerial activities (47.3%), lack of formal structures for engagement (43.8%) and lack of motivation from superiors (34.9%). and no formal schedule from the supervisor (32%). Only 7.7% reported no interest in these activities (Acheampong et al 2015). A qualitative study conducted in five tertiary hospitals in mainland Tanzania showed that limited skills, lack of self-confidence, poor communication, inferiority complexes and superiority behaviours among healthcare providers were among the barriers cited. Standard operating procedures (SOPs), policies, a shortage of pharmacists and inadequate on-the-job training were also highlighted. In some advanced countries, such as

Canada, where pharmaceutical care is well established, studies have shown that there are several barriers to providing efficient pharmaceutical care. Jorgenson et al. In 2014, described the obstacles the teams encountered during pharmacy integration as1. relationship, trust and respect; 2. Definition of the pharmacist role; 3. Guidance and support; 4. Pharmacist personality and professional experience; 5. Presence and visibility of the pharmacist; 6. Resources and funding; and 7. Value of the pharmacist role. Results from a study in Australia indicate that organizational factors, team composition, dynamics and networking, changing physician behaviour, clinical leadership and communication represent barriers to the implementation of pharmaceutical care (Newton et al. 2007). Documentation is the documents or records used to prove something or make something official (Royal Pharmaceutical Society of Great Britain 2006). A study conducted in Lagos, Nigeria by Okoye et al. categorized pharmacists' responses to documentation challenges into four themes; Factors such as people, facility, overwhelming problems, and government factors were considered by 51.6%, 48.4%, 37.3%, and 9.5% of participants, respectively. The challenges mentioned above include insufficient staff, inadequate protocols and documentation materials, insufficient time and inadequate power supply. The study also showed that actions taken to address these challenges were similar, targeting staffing, facility, overload and government factors, as reported by 35.7%, 22.2%, 21.7% and 12.7%, respectively. Participants reported that they would overcome these challenges by providing training for pharmacists, more time for interaction with patients, documentation materials, more delegation, and alternative care. Likewise, findings from a research study in two tertiary health centres in southeastern Nigeria indicate inadequate documentation of pharmaceutical care activities by pharmacists, necessitating the need for policy strategies for improved pharmaceutical care practices to improve patients' quality of life (Ogbonna et al. 2015).

Impact of Pharmacists' Led Intervention

Pharmacists are integral to healthcare teams, ensuring optimal patient care, medication safety, and improved health outcomes. Their roles include assessing patient health, formulating medication treatment plans, and educating both patients and families on pharmaceutical management (University of Findlay 2022). Pharmacists collaborate on medication-related issues, compound and dispense medications, and counsel patients regarding their drug therapy and any related therapy devices. Additionally, they perform drug regimen reviews with patients to discuss prescribed drugs and explain drug interactions (University of Findlay 2022). Pharmacist interventions significantly enhance patient care by improving chronic disease management and preventing medication administration errors (Rahayu 2021). These professionals play a crucial role in reconciling medications, detecting drug interactions, monitoring drug therapy through laboratory tests, and extending prescriptions when necessary (Rahayu 2021). Pharmacists advocate for patients, ensuring prescriptions are still beneficial and appropriate (Rahayu 2021). Their presence in interprofessional care teams positively impacts patient recovery, helping to reduce medical costs and increase the rationality of therapy for chronic diseases like hypertension, diabetes, and hyperlipidaemia (Rahayu 2021).

Recent studies highlight the pivotal role of pharmacists in various healthcare settings, particularly during the COVID-19 pandemic. Pharmacists have been instrumental in managing drug interactions, optimizing therapy, and therapeutic drug monitoring (TDM) for critical medications like antivirals and anticoagulants (Ahmed 2022). Additionally, interventions in special populations, such as those with chronic kidney disease or comorbidities like HIV, have shown significant benefits in therapeutic dosage adjustments (Ahmed 2022). Community pharmacies have also adapted by integrating tele-pharmacy services, improving patient access and reducing dispensing errors (Ahmed 2022). Pharmacists play a pivotal role in preventing

medication errors, which is crucial for patient safety. Studies have shown that the involvement of pharmacists in medication order reviews and clinical rounding activities significantly reduces the incidence of prescribing errors (Cabri 2021). Further, the presence of pharmacists during transitions of care has been associated with a lower incidence of medication errors and emergency room visits, highlighting their critical role in patient safety during these vulnerable periods (De Oliveira 2021). Pharmacists enhance patient medication compliance through tailored interventions. These include medication reconciliation, patient education, and the use of technology such as reminder systems via phone apps. Such interventions have proven effective in increasing adherence rates, with significant improvements in clinical outcomes for chronic conditions like hypertension, asthma, and COPD observed within months of follow-up (Torres-Robles 2022). Additionally, medication therapy management programs conducted by pharmacists help in identifying at-risk patients and improving their medication adherence, further contributing to better therapeutic outcomes (Shailendra S 2018).

Medication reconciliation by pharmacists is a critical process that ensures the accuracy of patient medication information across different stages of healthcare delivery. This process significantly reduces medication discrepancies during hospital admissions and discharges, thereby preventing potential adverse events. Pharmacists' involvement in medication reconciliation has been shown to reduce 30-day readmissions and improve overall patient care, demonstrating the importance of their role in managing patient medications effectively (Tanski 2023). Furthermore, pharmacists often lead or participate in training healthcare providers and support staff in medication reconciliation procedures, ensuring high standards of care are maintained. Pharmacist interventions have demonstrated a substantial impact on reducing hospital readmissions and emergency department visits. A study showed that clinical pharmacists involved in the discharge medication reconciliation process significantly lowered

unplanned readmission rates at 7 days for high-risk patients (Gallagher 2022). Moreover, pharmacist-run services in emergency departments have been linked to considerable cost savings by preventing hospital admissions and emergency visits (Dalton 2017). These interventions underscore the critical role of pharmacists in transitional care and their ability to enhance patient outcomes (Harris 2022). The economic benefits of pharmacist interventions are increasingly recognized in healthcare. Pharmacist-prescribing interventions for uncontrolled hypertension, for instance, are projected to save substantial amounts over 30 years by reducing cardiovascular events (Dixon 2023). Similarly, the implementation of a 24-hour emergency department pharmacy service has shown potential annual cost savings by preventing serious patient harm (Dalton 2017). These findings advocate for more robust study designs in future research to confirm these economic benefits and support the integration of clinical pharmacy services into broader healthcare management strategies (Dalton 2017).

1.3 Problem Statement

In the healthcare setting, pharmacists play a crucial role in documenting DTPs to ensure patient safety and optimal therapeutic outcomes. However, the process of evaluating and addressing these DTPs within the hospital setting often faces significant challenges. Despite past attempts, shortcomings persist in efficiently identifying, resolving and documenting DTPs, leading to suboptimal patient care and increased healthcare costs. The inability to effectively manage DTPs hampers the achievement of an ideal scenario where patients receive tailored and evidence-based therapies without encountering preventable complications. This problem not only affects the patients directly by compromising their health outcomes but also burdens healthcare systems with avoidable expenses and resource utilization. Healthcare professionals, particularly pharmacists, physicians and nurses, bear the brunt of navigating through unresolved DTPs, impeding the ability to deliver comprehensive patient care.

This research aims to evaluate the drug therapy problems documented by pharmacists in a hospital setting, characterize the prevalence of drug therapy problems encountered, examine pharmacist documentation practices of drug therapy problems in a hospital setting and describe the outcome of drug therapy problems identified by the pharmacist in a hospital setting.

1.4 Justification of Study

Clinical pharmacists are important members of the healthcare team and are uniquely positioned to optimize drug therapy and improve patient outcomes (Chisholm-Burns 2010). Their expertise in pharmacotherapy allows them to identify and resolve drug-related problems, prevent adverse drug reactions, and improve medication adherence. By researching documented medication therapy problems and pharmacist interventions, we can clarify pharmacists' specific contributions to patient care, thereby demonstrating their value and importance in the healthcare system. Furthermore, amid the evolving dynamics of healthcare delivery, there is a growing recognition of the need for collaborative, multidisciplinary approaches to patient care. With their specialist knowledge in the pharmaceutical sector, pharmacists play an important role in interdisciplinary teams and contribute to the holistic care of patients. Studies assessing drug therapy problems and pharmacist interventions can highlight collaborative efforts between pharmacists and other healthcare providers and promote teamwork and synergy in patient care. Furthermore, in resource-limited health facilities such as the University of Benin Teaching Hospital, it is essential to demonstrate the cost-effectiveness of pharmacist interventions. Research in this area can provide evidence of the economic benefits associated with pharmacist-led services, such as fewer hospital re-admissions, fewer adverse drug reactions and improved medication adherence. These findings can inform healthcare policymakers and administrators about the potential return on investment in expanding pharmacist-led services within the hospital. Additionally, research on pharmacist

interventions contributes to the broader goals of quality improvement and patient safety in healthcare. This research can help hospitals identify opportunities to improve medication management processes and prevent patient harm. This research can contribute to the development of best practices and guidelines for the delivery of pharmaceutical care, resulting in safer and more effective patient care, thereby advancing pharmacy practice.

1.5 Objectives of Study

Main Objectives

To evaluate the drug therapy problem documented by clinical pharmacist in a hospital.

Specific Objectives

1. To characterize the prevalence of drug therapy problems encountered
2. To examine the types of drug therapy problems documented in various pharmacy departments.
3. To determine the drugs with DTPs encountered.
4. To describe the outcome of resolution of drug therapy problems and prescribers' acceptance rate of the pharmacists' recommendation to the identified drug therapy problem.

CHAPTER TWO

METHOD

2.1 Study Design

A retrospective, descriptive, cross-sectional study aimed at evaluating drug therapy problems documented by clinical pharmacists in a hospital.

2.2 Study Setting

This study was conducted in thirteen pharmacy departments of the University of Benin Teaching Hospital (UBTH), Benin: Accident and Emergency (A&E), Child Health Emergency Room (CHER), Consultant Outpatient Department (COPD), Consultant Outpatient Department-National Health Insurance Scheme (COPD-NHIS), General Practice Clinic (GPC), General Practice Clinic-National Health Insurance Scheme (GPC-NHIS), Main Theatre, Medical Inpatient, O&G Inpatient, O&G Outpatient, Oncology, Ophthalmic, Quality Control (QC). UBTH is one of the leading teaching hospitals in Nigeria affiliated with the University of Benin. The hospital is a federal health facility strategically located in Benin City, the South-South geopolitical zone of Nigeria, and serves as a major location for the training of undergraduate and postgraduate doctors, as well as clinical training for other types of health care practitioners such as Pharmacists, Nurses, Physiotherapists, Medical laboratory scientists, and other medical support staff.

2.3 Study Population and Period

The study population consisted of data extracted from the activities of hospital pharmacists including the identification and resolution of drug therapy problems in the various pharmacy departments of the University of Benin Teaching Hospital (UBTH), Benin City between April 2015 and April 2024. The extracted data contains all documented data on drug therapy problems. All identified drug therapy problems documented and interventions implemented

within this period, whether accepted or rejected, resolved or unresolved, were included in the study. Any illegible and incomplete data within this period were not included in the study. In the pharmacies, drug therapy problems were documented manually using a notebook.

2.4 Research Instrument

The research instrument is a simple data collection form that contains important information such as the date the prescription was received, the department or unit of the pharmacy that received the prescription, as well as patient data such as age and gender, drug class affected by the drug therapy problem, disease category of the drug affected, intervention of the Pharmacist, response of the prescriber and the outcome of the intervention.

2.5 Ethical Consideration

Ethical approval for the study was obtained from the Health Ethics Review Committee (HREC) of the University of Benin Teaching Hospital with approval number ADME/E22/A/VOL. V11/1483815218884. Administrative approval was obtained from the head of the pharmacy department and the heads of the various pharmacy units. Confidentiality of patient data was ensured both during and after data collection.

2.6 Data Collection

The data collection process was performed by reviewing the patient's medical records in the intervention notes displayed in the pharmacy units throughout UBTH to extract the documented drug therapy problem and the intervention report.

2.7 Data analysis

Data were sorted, cleaned, coded, entered, and analyzed using Microsoft Excel 2019 MSO (version 2302). Descriptive statistics (frequency and percentage) were generated. All drug therapy problems documented by the clinical pharmacists were analyzed to determine the

required expected outcomes of the study. The prescriber acceptance rate was calculated by dividing the number of accepted interventions by the total number of interventions and then multiplying by 100.

CHAPTER THREE

RESULTS

Age and Gender of patients affected

Out of the total drug therapy problems (986) encountered, adults between the ages of 19 – 60 had the majority of cases with 267 (50.2%) occurrences of the total patient population recorded. Teenagers (13-18 years) had 15 (2.8%) occurrences of the total population recorded. Likewise, Males account for 218 (43.3%) of the patient population, which is substantial but less than that of females which account for 286 (56.7%) of the recorded data (See Table 3.1).

Table 3.1 Age and Gender of patients affected

Age of Patient	Frequency	Percent (%)
≤12	219	41.2
13 - 18	15	2.8
19 - 60	267	50.2
>60	31	5.8
Total	**532**	**100**

Gender of Patient	Frequency	Percent (%)
Female	286	56.7
Male	218	43.3
Total	**504**	**100**

Age distribution across the pharmacy units

The table below categorizes the different age groups according to pharmacy units where the DTPs were detected, offering a detailed analysis of where various age demographics are primarily served. Children (≤12 years) are predominantly seen in CHER and Quality Control. Adults (19-60 years) are the primary demographic in COPD NHIS, Medical Inpatient, O&G Outpatient, and Oncology. Geriatrics (>60) are largely seen in COPD-NHIS, Medical inpatient, and GPC pharmacies accounting for 90.3% (28) of their population (See Table 3.2).

Table 3.2 Age distribution across the pharmacy units

Unit of Pharmacy	Age group and Frequency				Total
	≤12	13 - 18	19 - 60	>60	
A&E	1	0	1	0	2
CHER	102	4	0	0	106
COPD	0	0	0	0	0
COPD NHIS	4	4	119	9	135
GPC	16	1	26	11	54
GPC NHIS	13	1	4	0	18
Main Theatre	2	1	0	2	5
Medical Inpatient	0	1	23	8	32
O&G Inpatient	17	0	2	0	19
O&G Outpatient	0	0	68	0	68
Oncology	0	0	17	0	17
Ophthalmic	6	0	2	0	8
Quality Control	59	3	5	1	68
Total	**219**	**15**	**267**	**31**	**532**

Gender distribution across the pharmacy units

The table highlights substantial disparities and variations in gender representation across different pharmacy units. A significant number of entries are marked as ‘Blank’, particularly in units like COPD, GPC NHIS, and A&E, indicating missing data or unrecorded gender information.

O&G Outpatient units show strong female dominance, whereas units like CHER and COPD NHIS display a more balanced gender distribution(See Table 3.3).

Table 3.3 Gender distribution across the pharmacy units

Unit of pharmacy	Gender and Frequency		Total
	Male	**Female**	
A&E	0	1	**1**
CHER	59	48	**107**
COPD	0	0	**0**
COPD NHIS	66	69	**135**
GPC	24	28	**52**
GPC NHIS	1	4	**5**
Main Theatre	4	1	**5**
Medical Inpatient	18	14	**32**
O&G Inpatient	0	2	**2**
O&G Outpatient	2	70	**72**
Oncology	7	9	**16**
Ophthalmic	5	4	**9**
Quality Control	32	36	**68**
Total	**218**	**286**	**504**

Frequency of DTPs encountered annually

The table below shows the frequency and corresponding percentages of documented drug therapy problems over a span from 2015 to 2024. There is a notable increase in frequency from 2015 to 2024, peaking in 2023 with 475 occurrences, which account for 48.2% of all instances during the examined period. This suggests a significant rise in the event or item being recorded as time progresses.

The years 2015 through 2017 show minimal activity, with the year 2017 recording no occurrences at all and the year 2016 recording 6 (0.6%) occurrences. The bulk of activity (2020 to 2024) comprises 900 (91.3%) of all recorded instances within the ten years, highlighting a concentrated surge in later years. (See Table 3.4).

Table 3.4 Frequency of DTPs encountered annually

Year	Frequency	Percent (%)
2015	6	0.6
2016	22	2.2
2017	0	0
2018	18	1.8
2019	40	4.1
2020	103	10.4
2021	*45*	4.6
2022	96	9.7
2023	475	48.2
2024	181	18.4
Total	**986**	**100**

Frequency of DTPs encountered by each unit of Pharmacy

The table below lists the frequency and corresponding percentages of drug therapy problems in pharmacy units involved within the healthcare setting. About 135 cases were recorded in COPD-NHIS representing 13.7%, A&E with 122 (12.4%), and GPC-NHIS with 123 (12.5%) units with COPD-NHHIS recording the highest and Main Theatre recording the lowest DTPs occurrences (See Table 3.5).

3.5 Frequency of DTPs encountered by each unit of Pharmacy

Unit of Pharmacy	Frequency	Percent (%)
A&E	122	12.4
CHER	109	11.1
COPD	87	8.8
COPD-NHIS	135	13.7
GPC	54	5.5
GPC-NHIS	123	12.5
Main Theatre	14	1.4
Medical Inpatient	33	3.3
O&G Inpatient	65	6.6
O&G Outpatient	73	7.4
Oncology	18	1.8
Ophthalmic	85	8.6
Quality Control	68	6.9
Total	**986**	**100**

Frequency of DTPs encountered by each unit of pharmacy annually

The table below outlines the annual frequency of reported DTPs by pharmacists across various units from 2015 to 2024, with each unit showing varying levels of reporting throughout the years. The O&G Outpatient unit is the only unit with documented DTPs for most of the study period. In 2018, the CHER unit started documenting with 15 DTPs which covered a staggering 83% of the cases reported that same year. Despite not recording any DTPs initially, COPD-NHIS, GPC-NHIS, and Ophthalmic pharmacy units rose to become valuable contributors by 2023. By 2023, every single pharmacy unit had successfully recorded a minimum of eight drug therapy problems (See Table 3.6).

Table 3.6 Frequency of DTPs encountered by each unit of pharmacy annually

Unit of pharmacy	Year and Frequency										Total
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
A&E	0	0	0	0	2	44	10	15	40	11	122
CHER	0	0	0	15	27	22	8	13	17	7	109
COPD	0	0	0	0	0	0	0	0	83	4	87
COPD-NHIS	0	0	0	0	0	3	9	20	88	15	135
GPC	0	0	0	0	4	20	3	0	27	0	54
GPC-NHIS	0	0	0	0	0	0	0	0	32	91	123
Main Theatre	0	0	0	0	0	0	0	6	8	0	14
Medical Inpatient	0	0	0	0	0	6	7	0	20	0	33
O&G Inpatient	0	0	0	0	6	1	0	10	40	8	65
O&G Outpatient	6	22	0	3	1	6	1	14	16	4	73
Oncology	0	0	0	0	0	0	0	1	12	5	18
Ophthalmic	0	0	0	0	0	0	7	6	51	21	85
Quality Control	0	0	0	0	0	1	0	11	41	15	68
Total	**6**	**22**	**0**	**18**	**40**	**103**	**45**	**96**	**475**	**181**	**986**

Types and Frequency of DTPs

The types and frequency of different classes of drug therapy problems identified are presented in Table 3.7. Dosage problems were predominant, with 'Dosage too high' occurring in 363 cases (36.8%) and 'Dosage too low' in 209 (21.2%) together accounting for over half of all cases indicating a common problem with prescribed doses being higher or lower than necessary. Inappropriate Adherence is the least frequent problem, with 15 cases, or 1.5%, related to patients not following the prescribed therapy correctly, whether overusing or underusing their medication or due to cost (Table 3.7).

Table 3.7 Types, distribution and Frequency of DTPs

Class of Drug therapy problem	Frequency	Percent (%)
Adverse drug reaction	43	4.4
Dosage too high	361	36.6
Dosage too low	212	21.5
Inappropriate adherence	15	1.5
Needs additional therapy	102	10.3
Unnecessary drug therapy	79	8.0
Wrong drug	174	17.6
Total	**986**	**100**

Types and Frequency of DTPs across the pharmacy units

The table below provides a breakdown of various drug therapy problems across different pharmacy units, showing how each problem is distributed across units. Dosage too high has the highest occurrences in all units except COPD and Oncology units where the wrong drug and the need for additional therapy are the dominant problems respectively. Needs for additional therapy are noted 100 times (10.1%), with 23 (22.5%) cases in Ophthalmic which amounts to 23 cases (See Table 3.8).

Table 3.8 Types and Frequency of DTPs across the pharmacy units

Class of Drug therapy problem	Unit and pharmacy and Frequency													Total
	A&E	CHER	COPD	COPD NHIS	GPC	GPCNHIS	Medical Inpatient	O&G Inpatient	O&G Outpatient	Oncology	Ophthalmic	QC	Main Theatre	
Adverse drug reaction	0	2	1	1	3	18	2	2	11	0	2	0	1	**43**
Dosage too high	40	65	19	55	24	28	16	25	22	5	34	24	6	**363**
Dosage too low	25	25	15	28	11	34	7	19	11	2	10	20	2	**209**
Inappropriate adherence	0	0	2	1	0	8	0	1	3	0	0	0	0	**15**
Needs additional therapy	2	3	16	16	0	9	1	0	3	7	23	17	3	**100**
Unnecessary drug therapy	16	1	3	20	6	11	4	2	14	0	0	1	1	**79**
Wrong drug	39	13	31	14	10	15	3	16	9	4	16	6	1	**177**
Total	**122**	**109**	**87**	**135**	**54**	**123**	**33**	**65**	**73**	**18**	**85**	**68**	**14**	**986**

Frequency distribution of class of drugs affected by the drug therapy problem identified.

In the figure below, the frequency of the different classes of drugs affected by the drug therapy problem is shown. Of all the classes of drugs affected, antibiotics are the most affected drug with 249 (25.3%) occurrences equating to more than one-quarter of the total population. Antihypertensive is next on the line with 103 (10.4%) occurrences closely followed by centrally acting drugs with 91 (9.2%) occurrences (See Figure 3.1).

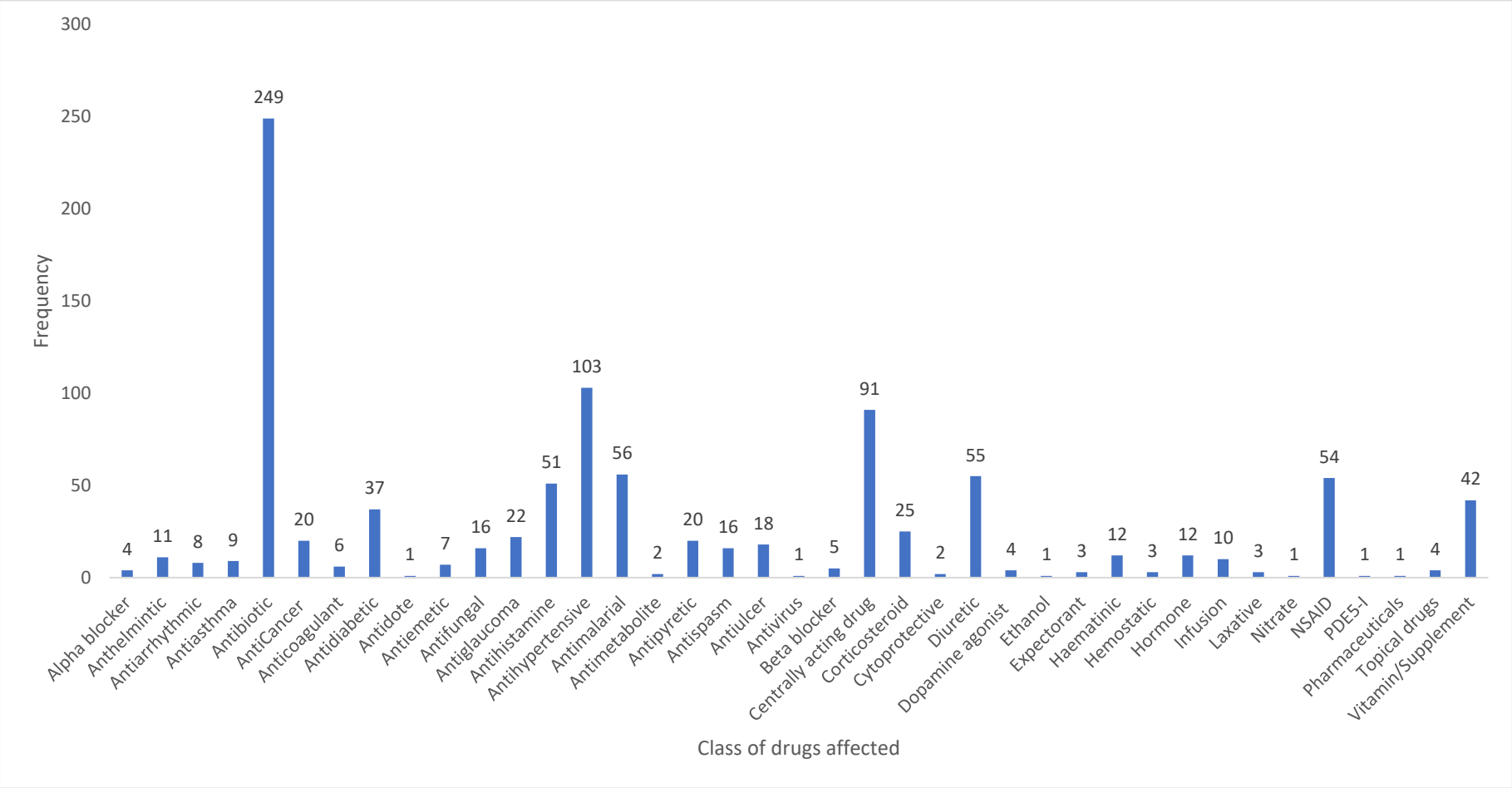

Figure 3.1 Frequency distribution of class of drugs affected by the drug therapy problem identified.

Frequency of disease category of class of drug affected by the drug therapy problem.

This chart shows the frequency of the disease category of the different classes of drugs affected by the drug therapy problem. Of all the disease categories of classes of drugs affected, bacterial infection is the most prevalent disease state occurring 248 times equating to almost one-quarter of the total disease population. Cardiovascular disease is next with 172 (17.4%) occurrences closely followed by pain occurring 73 (7.4%) times (See Figure 3.2).

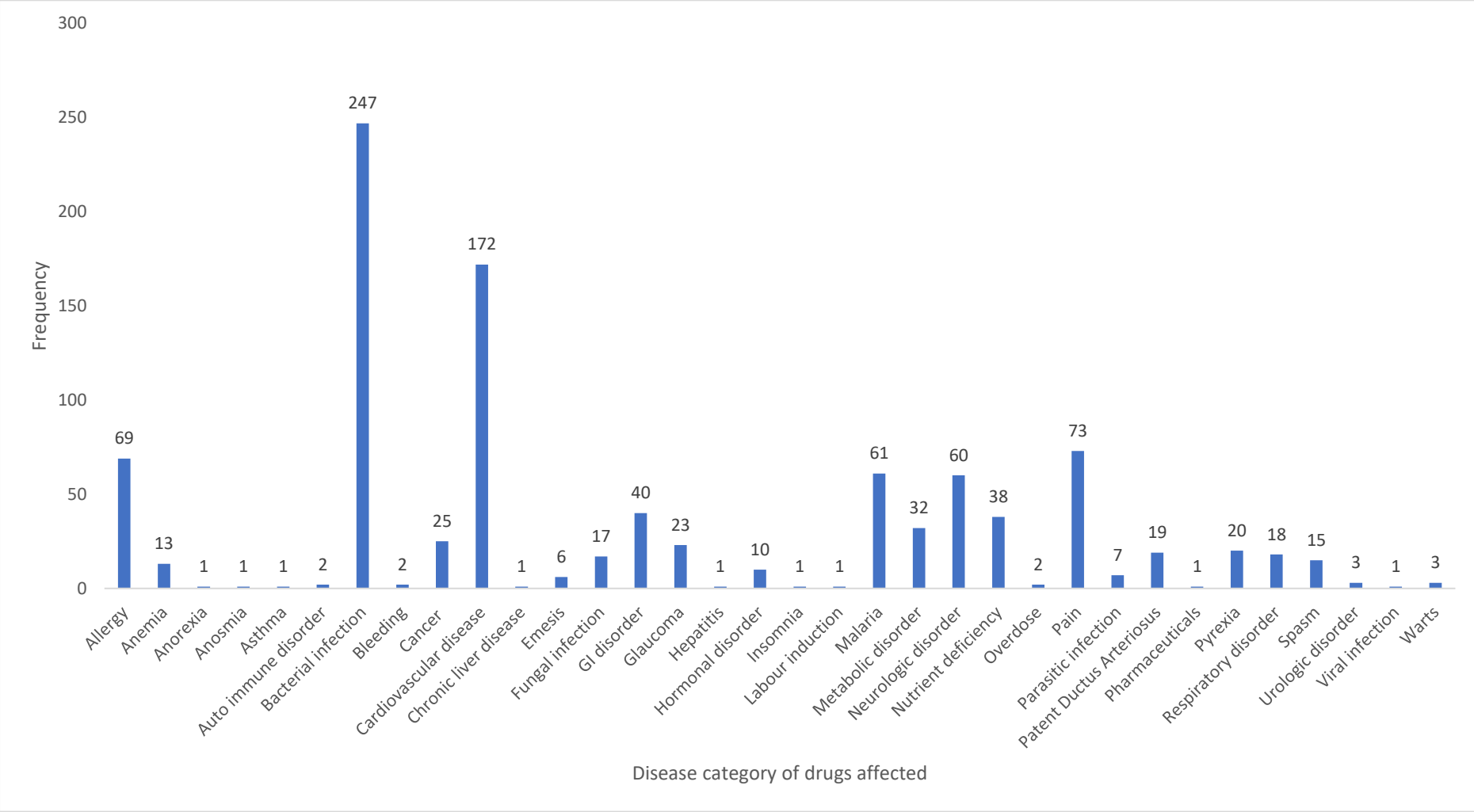

Figure 3.2 Frequency of disease category of class of drug affected by the drug therapy problem.

Frequency of Pharmacists' intervention by each unit of Pharmacy

Table 3.9 shows the frequency of pharmacists' intervention across the units of pharmacy. Out of the 986 DTPs documented, the pharmacists intervened by contacting prescribers 851 times (86.3%), and the prescribers were not contacted 135 times (13.7%). The prescribers accepted pharmacists' recommendations 847 times (99.53%) and rejected 4 (0.47%) recommendations indicating the prescribers' acceptance rate of 99.53%. All drug therapy problems whether their interventions were accepted or rejected were resolved

COPD-NHIS pharmacy contacted the prescriber the most (129 times) closely followed by A&E pharmacy and CHER pharmacy with 120 and 109 times respectively. COPD pharmacy contacted the prescriber the least (4 times) but did not contact the prescribers 83 times representing 61.5% of all the times the prescriber was not contacted.

3.9 Frequency of Pharmacists' intervention by each unit of Pharmacy

Unit of Pharmacy	Prescriber Contacted	Prescriber not Contacted	Total
A&E	120	2	**122**
CHER	109	0	**109**
COPD	4	83	**87**
COPD-NHIS	129	6	**135**
GPC	54	0	**54**
GPC-NHIS	82	41	**123**
Main Theatre	14	0	**14**
Medical Inpatient	33	0	**33**
O&G Inpatient	65	0	**65**
O&G Outpatient	71	2	**73**
Oncology	18	0	**18**
Ophthalmic	85	0	**85**
Quality Control	67	1	**68**
Total	**851**	**135**	**986**

CHAPTER FOUR

DISCUSSION

Pharmaceutical care subscribes that pharmacists take responsibility rather than merely provide functions. They have to be able to identify patients drug therapy needs and meet them better than anyone else (Ogbonna et al 2015). As it is often said if it wasn't documented, then it didn't happen. Documentation, which is one bedrock of pharmaceutical care generates information for audit trail and continuity of care. This requires competency which is characterized by strong knowledge, skills, behaviors, and values.

Identification, prevention, and resolution of potential/actual DTP are critical pharmacists' interventions that can improve the outcome of therapy and reduce the harm associated with medicine use. In this study, pharmacists carried out interventions to prevent DTPs. Intervention by pharmacists often leads to the modification of prescriptions for improved therapeutic effectiveness, and improved adherence monitoring (Ojeh et al2015).

Prevalence of drug therapy problems

Unlike previous studies reporting a high rate of DTPs (Li et al 2014, Agu et al 2014, Chiampas et al 2015). This study retrospectively identified a low rate of drug therapy problems identification and documentation by pharmacists in UBTH. UBTH is a 910-bed multispecialty healthcare service provider in Ugbowo, Benin city. It was established on May 12, 1973 following the enactment of an edict of the Nigeria National Health Act (Wikipedia 2023). It offers consultancy, inpatient and outpatient services. Presently, pharmacy departments are divided into three main division: Patient services division, Procurement division, and special project/Quality assurance division comprising about fourteen pharmacy units. Each of the units is equipped with an average of two qualified pharmacists with degrees in B Pharm, Pharm D, and Master's degrees in various fields (UBTH 2024). Igomuanye reported in 2023 that the Chief Medical Director of the teaching hospital: Prof.

Darlington Obaseki disclosed that the hospital currently attends to 400,000 patients annually with an average bed occupancy rate reaching 70 percent (pre-COVID-19) with a daily average of 1,006 patients in Outpatient clinics, 44 patients in Emergency Room, 74 admissions and 54 discharges and also receives 72 referrals from other healthcare facilities in Edo and other neighboring states (Ighomuaye 2023). A total of 986 drug therapy problems were recorded during 10 years averaging 98.6 interventions per year affecting a large pool of patients. The low DTP rate in this study is not similar to a Saudi Arabian study (Al Rahbi, 2014). In comparison with a Saudi Arabian study which identified a total of 2564 prescription errors during six months affecting 1565 patients in a ratio of 1.7 pharmacist intervention for encountered prescription error per patient, the intervention rate is low (Alzahrani et al 2021). The low rate of DTPs observed in this study might be a reflection of the quality of prescription practice in the study setting. The implication of this is that patients may be at risk of harm due to undetected drug therapy problems, and healthcare resources may be wasted due to unnecessary hospitalizations, prolonged stays, and additional treatments. Furthermore, pharmacists' expertise and skills are not being fully utilized, leading to a missed opportunity for optimizing medication use and improving patient outcomes. This highlights the need for healthcare providers and policymakers to prioritize strategies to improve pharmacists' training, resources, and practice environments to enhance patient care. Quality improvement initiatives should focus on enhancing pharmacists' involvement in patient care, particularly in identifying and resolving drug therapy problems, to ensure patient safety and optimal healthcare outcomes. Strategies to improve rational prescribing in the clinic included regular training of all those involved in drug therapy management, the use of structured prescription order forms, and simplification of the treatment regimen using fixed-dose combinations (FDC). Despite good prescribing practice, under-reporting, which is common practice as noted in another study which reported that less than 30% of procedures performed on the ward were not documented (Boardman 2001), could be at play contributed to the low prevalence of the interventions observed in the study.

Although good prescribing practices were observed, the low prevalence of interventions in the study may be attributed to under-reporting, a common issue in healthcare documentation, as highlighted in a previous study where a significant number of ward procedures were found to be undocumented (Boardman, 2001). This lack of documentation may have contributed to the underestimation of interventions in the present study. The main reason for this attitude was lack of time. Other grounds for the low intervention rate included inadequate pharmacotherapy skills and perception of the significance of prescription error (Abah et al 2013).

This study showed that drug therapy problems were more common in the Consultant Outpatient Department (COPD) NHIS pharmacy department than in any other pharmacy department in the hospital. Financial accessibility may play a role, in more affordable medication options to patients as they are enrolled in the National Health Insurance Scheme (NHIS) compared to other pharmacy departments which serve exclusively to some segmented patients and or are not covered by NHIS. Additionally, a higher patient volume in the COPD department may have led to a higher likelihood of drug therapy problems due to sheer volume. Among the different age groups, adult patients between the ages of 19 and 60 were mostly affected. This is not in tandem with some studies that identified the age group of 65 and above as the most affected. The difference could be attributed to the larger range of adult groups included in this study which included young adults which reflects the overwhelming population of young adults in Nigeria where two-thirds of the population is between 19 to 60 (Leape et al 1999, Kozer et al 2002). About half of the drug therapy problems were documented without age. This may be due to the non-standardized format of documenting drug therapy problems in the healthcare setting inadequate patient assessment, incomplete medical records, or poor communication among healthcare providers. The use of a structured standardized format of documentation within the healthcare setting will help resolve this.

Documented drug therapy problems obtained by females were the majority when compared to males, this can be explained because women are more likely to seek medical care which may lead to a higher likelihood of drug therapy problems being identified and documented. Additionally, women are more likely to experience polypharmacy due to various health conditions, which increases the risk of drug interactions and therapy problems. Hormonal differences and gender-specific health conditions may also affect drug metabolism and response, leading to a higher incidence of drug therapy problems in women. Furthermore, women may be more likely to report adverse drug events and seek medical attention for medication-related issues, and healthcare providers may be more likely to document drug therapy problems in women due to biases or differences in communication styles. Similar results were viewed in a Dutch study where male interventions constitute almost half and females constitute the majority of the interventions. It's also similar to an Oman study where females accounted for more than half of the interventions and males were traced behind but the opposite was in Australia where research revealed that the males accounted for the majority of the interventions and the females were traced behind. (Alderman and Farmer 2001; Bosma et al 2007, Al Rahbi et al 2014). About half of the drug therapy problems were documented without gender. This underscores the need to adopt the use of a structured standardized format of documentation within the healthcare setting will aid data collection and analysis.

Types of Drug Therapy Problems Documented

In this study, pharmacists recorded 7 different classes of drug therapy problems, where most of the drug therapy problems recorded were related to prescribing wrong doses accounting for more than half of the drug therapy problems (dosage too high - 36.8% and dosage too low - 21.2%). This is consistent with the findings of another study conducted again in Saudi Arabia; a university hospital in Riyadh. The leading drug therapy problems reported were associated with wrong dose

and wrong strength (Al-Dhawailie et al 2011). It's also consistent with research that was conducted in a teaching hospital in the UK which reported that prescribing errors accounting for more than half of the drug therapy problems were associated with choice of dose (Dean et al 2002). A systematic review of nine studies involving 3507 records reported that the most prevalent prescribing error was the wrong dose (Alanazi et al 2016). Synonymous with previous studies (Agu et al 2014), the drug therapy problem of the wrong drugs was common in this study with less than one-quarter of the total DTPs encountered. Prescribing the wrong medication is a serious mistake that, if not corrected, can lead to health problems. The implication of this is that there is a significant issue with prescribing errors, specifically with incorrect dosing, which can lead to patient harm. It also emphasizes the importance of pharmacists' role in identifying and resolving drug therapy problems, and the need for continued monitoring and evaluation to ensure patient safety. There is an overarching need to strengthen the prescribing process by standardizing the prescribing process, establishing independent controls for critical steps in the process, and learning from errors that occur. Feedback control systems and immediate and regular prescription reviews help reduce medical mishaps due to the prescription of incorrect medications. In addition, training and retraining of prescribers and peer group discussions should be adopted as schemes to promote rational prescribing (Bradley et al. 1997). The pharmacists' intervention for adjusting doses was the most prevalent followed by the substitution of medications. Surprisingly, this study reported a low incidence of pharmacist interventions related to adverse drug reactions and this differs contrastingly to findings by the Harvard Medical Practice study which discovered a higher rate of interventions related to adverse drug reactions in hospitals and emergency department settings (Mohebbi et al 2012). This is because the Harvard study was conducted in an emergency department where most adverse were detected (Wang et al 2015) while this study included all patients admitted to the hospital. One of the key things noticed by the dispensing pharmacists was the medication adherence problem. In this study, it was observed that a small number of

interventions were aimed at improving patient compliance. These results indicate that the dispensing pharmacists at the various pharmacy units are interacting with the patients and counselling them to improve medication compliance and also making them understand the importance of compliance.

The pharmacists' intervention improved the balance between necessity and concern beliefs about medication, and efficiently resolved practical barriers to medication-taking thereby improving medication adherence in non-adherent Rheumatoid Arthritis patients (Zwikker et al., 2012). One of the recent prospective studies carried out to know the impact of clinical pharmacists' interventions concluded that the impact of clinical pharmacists providing patient counselling had a positive impact on medication adherence and quality of life (Ramanath et al 2012; US Food and Drug Administration, 2011). Despite the different interventions required by pharmacists to prevent drug therapy problems, evidence suggests that hospital pharmacist's participation in patient care can significantly decrease avoidable drug therapy problems yet there is limited information available on pharmacist-led interventions, especially within the local context; Nigeria. A meta-analysis of four controlled trials investigating the impact of pharmacist's interventions on drug therapy problems revealed that pharmacists' interventions have a significant impact in reducing drug therapy problems (Cunningham 2012). This study's results were consistent with the findings reported in the meta-analysis in terms of reducing avoidable prescription errors.

Incidence of Drugs with Drugs Therapeutic Problems

This study explored the various classes of drugs and their relationship to the incidence of DTPs. The findings revealed that the systemic use of antibiotic agents was a primary contributor to DTPs, with a significant proportion of DTPs attributed to this class of drugs. This finding aligns with recent research indicating that drug therapy problems are frequently linked to antibiotic orders (Lucca et al., 2012). Furthermore, the study revealed that other commonly used drugs were

antihypertensives, centrally acting drugs, antimalarials, diuretics, and NSAIDs, which accounted for a significant proportion of prescriptions. In contrast, a study conducted in Jordan found that antihypertensive drugs, anticoagulants antiplatelets, and antiulcer drugs were the most frequently prescribed medications, highlighting regional variations in prescribing patterns. This could be due to there were a higher number of bacterial infections, hypertension, and neurologic disorders in the health care setting. Another study conducted in 20 hospitals in the UK that included 26,019 prescriptions showed that the most prescription errors were in parenteral administration of drugs, however, they reported that cardiovascular and endocrine medications were the most common classes associated with drug therapy problems (Akbarov et al 2015). These findings imply that the excessive and inappropriate use of antibiotics in the teaching hospital led to a significant number of drug therapy problems (DTPs). This can result in adverse drug events, harm to patients, and increased healthcare costs. The overuse and misuse of antibiotics also increase the risk of antibiotic resistance, making infections harder to treat. This highlights the need for urgent action to address the issue, including the implementation of antibiotic stewardship programs and education for healthcare professionals. Patient safety and trust in the healthcare system are also at risk. The findings emphasize the importance of responsible antibiotic use to prevent harm and promote optimal patient care.

The most common diseases encountered were characterized by a predominance of bacterial infections, followed by cardiovascular disease, pain, allergy, malaria, and neurologic disorders. A study conducted in Jordan revealed that systemic hypertension was the primary diagnosis, highlighting the significance of this condition in the region. Infection (McMillan 1986) and malaria (Duguma 2022) are pervasive health concerns in many developing countries, necessitating concerted efforts to address these pressing issues. The study examined a total of nearly one thousand drugs, which, although a substantial number, pales in comparison to the larger cohort

investigated in the Jordanian study (Singh 2011). It showed that Outpatient Clinics (COPD, COPD-NHIS, Ophthalmic, O&G Outpatient, GPC and GPC-NHIS) and Emergency Room (CHER, A&E) pharmacy units in the hospital recorded the most DTPs. This is because the volume of patient in these units is high with a daily average of 1,006 patients in the Outpatient Clinic and 44 in Emergency Room (Ighomuaye 2023).

Outcome of Resolution of Drug Therapy Problems

The best thing found in the study is that the interventions undertaken by the pharmacists are well received and accepted by the working physicians in the hospital. This symobolizes that the health care system in UBTH is patient-centred. Also, it is an opportunity for the pharmacist to make meaningful contributions to optimize patients' drug therapy and reduce harm related to medicine in a multidisciplinary healthcare team. Pharmacist should therefore consider their roles as critical in the medication use process and proactively contribute to rational drug use (Ojeh et al 2015). This study's outcomes surpasses those of a prior Dutch investigation, which reported a notable acceptance rate among prescribers (Bosma et al., 2007). Nevertheless, our findings resonate with the conclusions drawn by Abah et al. (2013) and Al Rahbi et al. (2014), underscoring a harmonious alignment of results across these studies. A four-year prospective study revealed that the frequency of pharmacists' interventions remained consistent throughout the study period, with a notable proportion of interventions being accepted, refused, and deemed not assessable (Charpiat et al., 2012). The acceptance rate in this study was higher compared to Klopotowska's study, which reported a significantly higher acceptance rate (Klopotowska et al., 2010).

4.1 Strengths and Limitations of Study

Strengths of study

This research has a clearly described objectives and findings. It employed a large sample size and period. Also, it investigated an important research question that can lead to future studies to

enhance the current pharmacy practice towards safer medication use, preventing or minimizing drug therapy problems in the hospital and improving healthcare.

Limitations of study

Firstly, the drug therapy problems were extracted from the medical records and some drug therapy problems may have been under-reported, therefore future prospective approaches should be conducted. Secondly, although the study was conducted in a single tertiary hospital that is considered one of the largest hospitals nationally, this limits the generalizability of the study result to other practices within Nigeria. As such there's a need for future multicentred studies that will include different hospitals with different practices.

This study necessitates the conduction of future studies to evaluate the prevalence of drug therapy problems prospectively and therefore, the impact of pharmacists' interventions on reducing drug therapy problems and medication-related adverse events from reaching patients. Future studies should aim to evaluate the impact of pharmacists' interventions on patient outcomes, including the reduction of adverse drug events, hospital readmissions, and healthcare costs. Furthermore, longitudinal studies can help identify patterns and trends in drug therapy problems, informing the development of targeted interventions and quality improvement initiatives.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Over a decade, the documented drug therapy problems (DTPs) were surprisingly low for a major teaching hospital. A review of the recorded DTPs revealed a notable portion occurred in females, while a smaller proportion affected males, and a significant number lacked gender documentation. A significant proportion of the interventions were focused on pediatric patients under 12 years old, while the greater percentage was directed toward adults over 19 years old. Notably, a substantial number lacked age group documentation. All 7 classes of DTPs were represented with dosage too high being the most prevalent DTP while inappropriate adherence is the least prevalent. All drug therapy problems recorded were resolved. The prescribers demonstrated a remarkably high acceptance rate of the pharmacists' recommendations for the identified drug therapy problem, with nearly all suggested interventions being implemented, indicating a strong collaborative approach to addressing drug therapy problems.

5.2 Recommendations

1. The absence of a patient database on drug therapy problems (DTPs) in some pharmacy units suggests a lack of proactive monitoring for potential or actual drug-related issues. To address this gap, we recommend that hospital administrations implement an institutional policy mandating the systematic documentation of DTPs. This would facilitate the identification and resolution of drug therapy problems, ultimately enhancing healthcare.
2. The variability in documentation formats and modes highlights the need for a unified, structured approach to recording drug therapy problems (DTPs) within healthcare settings The establishment of a standardized documentation protocol would provide valuable insights into DTP trends, informing quality improvement initiatives and promoting

evidence-based practice. Implementing a standardized format for DTP documentation would facilitate efficient data collection, analysis, and dissemination, ultimately enhancing the quality and safety of healthcare services. A standardized documentation framework would also enable the identification of trends and patterns in DTPs, informing evidence-based practice, and driving continuous quality improvement initiatives. Moreover, this approach would promote interprofessional communication, collaboration, and learning, contributing to optimal patient.

3. Digitizing pharmacists' intervention documentation is a crucial step towards enhancing data management and utilization. This transition would enable flexible data capture, analysis, and reporting, facilitating the generation of customizable reports and exports. As noted by King et al. (2007), digital approach would streamline the sharing of intervention data within and beyond pharmacy and healthcare services. Leveraging modern electronic systems, such as handheld technologies, web-based programs, and commercial tools like Quantifi, would simplify the documentation process, ensuring consistency and efficiency in recording pharmacists' interventions. As MacKinnon (2003) highlighted, these systems would have far-reaching applications across entire healthcare services, ultimately contributing to improved patient care and outcomes. By embracing digital documentation, healthcare providers can harness the power of data to inform decision-making, drive quality improvement, and promote optimal healthcare delivery.
4. To enhance the safety and efficacy of the prescribing process, we recommend the standardization of the prescribing process to ensure consistency and clarity. Additionally, independent controls for critical steps in the process should be implemented to minimize errors. Feedback control systems and regular prescription reviews should be established to identify and learn from errors. Regular training and retraining programs for prescribers should be provided to promote rational prescribing practices, and peer group discussions

should be facilitated to encourage knowledge sharing and best practices. These strategies aim to strengthen the prescribing process, reduce medical errors, and improve patient outcomes, and their effectiveness should be investigated in future research.

5.3 Contribution to knowledge

1. This study reported a low rate of drug therapy problems identification and documentation by pharmacists in UBTH which suggest poor documentation practices or inadequate incentives towards the pharmacists within the setting.
2. This study also identified gender differences in the documented drug therapy problems with a higher proportion documented for female patients than males.
3. It identified the wrong dosage as the most common DTP in the hospital. It also revealed antibiotics and antihypertensives as the most frequent drugs associated with DTPs in the hospital suggesting the need for enhanced monitoring and education around rational use of drugs. It also correlated DTPs with the associated diseases, showing that bacterial infections and cardiovascular disease are the most prevalent disease. This association is valuable for targeted interventions and medication management strategies
4. By detailing the prevalence of DTPs encountered in UBTH, this study showed that pharmacists play a critical role in improving therapeutic outcomes and reducing the harm associated with medication use through proactive intervention.
5. This study also highlighted that pharmacists' interventions are well-received and accepted by the prescribers in the hospital.

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APPENDIX

Data Collection Form

Date: Month: …… Year: ……

Age: ≤12 [ ] 13-18[ ] 19-60 [ ] >60[ ]

Gender: Male [ ] Female [ ]

Unit/Department of Prescription: ……..……..…….....

Unit/Department of Pharmacy that received Prescription: ..……...

Class of Drug Affected: ……...……

Disease Category of Drug Affected: ……...……..…..

Drug Therapy Problem: ……...…….…...

Intervention: Prescriber Contacted [ ] Prescriber Not Contacted [ ]

Prescriber Response: Accepted and corrections effected [ ]

Accepted but corrections not effected [ ]

Rejected [ ]

Outcome: Resolved [ ] Not Resolved [ ]