Standardization of drug therapy problems (DTPs) interventions in pharmaceutical care: a pathway for enhancing patient outcomes

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ABSTRACT

Pharmaceutical care in Nigeria's hospital and community settings has become a vital component of healthcare delivery. However, the absence of standardized protocols has led to inconsistent practices across institutions and regions. This review examines pharmacists' knowledge, attitudes, practices, and behaviors in delivering pharmaceutical care, with a focus on intra- and inter-professional collaboration. It also explores how lifestyle factors influence pharmacokinetics, pharmacodynamics, and biopharmaceutics, affecting therapeutic outcomes.A literature search covering publications from 2000 to 2025 was conducted using databases such as Google Scholar, PubMed, Web of Science, Embase, and Scopus. Keywords included "pharmaceutical care," "healthcare collaboration," "standardized protocols," "drug therapy problems," and "variability in practice."Findings suggest that pharmaceutical care practices in Nigeria are often shaped by informal norms, training differences, and individual experiences, rather than structured guidelines. This results in variability in care quality and teamwork efficiency. Inter-professional relationships, particularly communication and collaboration between pharmacists and other healthcare professionals, play a critical role in care outcomes.Although pharmacists are generally committed to patient welfare, factors such as limited continuing education, resource constraints, and systemic challenges undermine optimal care delivery.The review advocates for the development and implementation of standardized, evidence-based pharmaceutical care protocols. It emphasizes the need for enhanced professional training, improved communication, and stronger interdisciplinary collaboration to ensure consistent, high-quality care across the healthcare system in Nigeria.

Keywords: Pharmaceutical care, Healthcare collaboration, Standardized protocols, Inter-professional relationships, Nigeria healthcare system

Introduction

Drug therapy problems (DTPs) are a critical focus in pharmaceutical care and represent a significant area of pharmacist intervention aimed at improving the therapeutic outcomes for patients and reducing the harm associated with medications [1]. DTPs arise when there are issues related to the appropriateness, effectiveness, safety, or adherence to prescribed drug regimens. Addressing these problems can significantly enhance patient safety, treatment effectiveness, and healthcare quality [2]. Pharmacists play a crucial role in identifying, assessing, and resolving DTPs through direct interaction with patients and other healthcare providers. This paper discusses the importance of DTP identification and resolution, the varying approaches for addressing DTPs in different healthcare settings, and the need for standardization in the delivery of pharmaceutical care to ensure consistent, high-quality patient care [3].

Methods

This review employed a systematic approach to identify, evaluate, and synthesize relevant literature on pharmaceutical care practices in Nigeria's hospital and community pharmacy settings. The primary aim was to explore pharmacists' knowledge, attitudes, behaviors, and practices, with a specific focus on the impact of standardized protocols, interprofessional collaboration, and lifestyle-related pharmacological factors on therapeutic outcomes.

Literature search strategy

A comprehensive literature search was conducted across five electronic databases: Google Scholar, PubMed, Web of Science, Embase, and Scopus. The search covered a 25-year period from January 2000 to February 2025. Relevant publications were identified using combinations of keywords and Boolean operators, including:"pharmaceutical care", "healthcare collaboration", "standardized protocols", "drug therapy problems", "variability in practice", "pharmacists in Nigeria", "pharmacokinetics and lifestyle", and "inter-professional collaboration"

Inclusion and Exclusion Criteria

To ensure relevance and quality, articles were selected based on the following criteria: studies conducted in Nigeria or involving Nigerian healthcare professionals, research articles, reviews, policy papers, and reports addressing pharmaceutical care practices, healthcare collaboration, or patient-centered care and publications written in English.

Articles were excluded if they focused solely on clinical trials of specific medications without reference to pharmaceutical care models; not peer-reviewed or lacked sufficient methodological detail; and if duplicated publications or abstracts without full texts.

Data Extraction and Analysis

Data were extracted using a structured template capturing: study type, setting (hospital or community), study population, key findings related to pharmaceutical care practices, collaboration, and system-level challenges. Attention was also paid to discussions on lifestyle influences on pharmacokinetics and pharmacodynamics. Thematic analysis was employed to identify recurring patterns and critical gaps across the literature.

Quality Assessment

The methodological quality of included studies was evaluated using appropriate tools depending on study design (e.g., CASP checklists for qualitative studies, STROBE for observational studies). Only studies meeting minimum quality thresholds were included in the synthesis.

Discussion

Pharmaceutical care and drug therapy problems (DTPs)

Pharmaceutical care is a patient-centered approach to pharmacy practice that focuses on optimizing the use of medications to achieve desired therapeutic outcomes [4]. One of the primary goals of pharmaceutical care is to identify and resolve DTPs that may affect patient safety and treatment outcomes. DTPs can manifest in various forms, including medication errors, inappropriate drug choices, dosage issues, or lack of adherence to prescribed regimens. According to the American Society of Health-System Pharmacists (ASHP), DTPs can be categorized into several key areas: drug effectiveness, drug safety, drug interactions, and issues related to patient compliance or adherence [5].

Pharmacists are uniquely positioned to intervene in these issues through direct medication therapy management (MTM). MTM is a comprehensive, patient-specific service designed to optimize therapeutic outcomes by assessing the drug therapy regimen, identifying any DTPs, and making the necessary recommendations for resolution [6]. The pharmacist's role in identifying and resolving DTPs can prevent adverse drug events (ADEs) and medication-related problems, thereby reducing healthcare costs, and improving patient outcomes (Chisholm-Burns et al., 2010) [7].

The pharmacist's role in identifying and resolving DTPs

Pharmacists influence healthcare outcomes positively by scrutinizing prescriptions, identifying DTPs, and collaborating with other healthcare professionals to resolve these issues. DTPs can vary widely in terms of their clinical significance, and their severity must be assessed to determine the likelihood of harm to the patient [10]. In a hospital setting, DTPs may be related to complex medication regimens, polypharmacy, or patients with multiple co-morbidities. In ambulatory and community care settings, DTPs may involve

such as medication non-adherence, lack of proper counseling, or drug interactions due to self-medication [11].

The pharmacist's role in the identification and resolution of DTPs typically involves several stages, including: Prescription Review - this is the process of reviewing a patient's medication orders to identify potential problems related to drug selection, dosing, or duration of therapy; Patient Assessment- Pharmacists assess the patient's clinical status, medication history, and adherence to prescribed therapies; Risk Assessment- this involves evaluating the potential risks associated with identified DTPs, including the severity of the problem and the likelihood of harm to the patient; Intervention and Communication- Pharmacists collaborate with other healthcare professionals to make recommendations and resolve identified DTPs. Effective communication ensures that resolution of these issues leads to improved patient outcomes [12].

Approaches to delivering pharmaceutical care

Pharmaceutical care can be delivered through different methods depending on the setting and patient needs [13]. The traditional face-to-face consultation remains the most common approach, particularly in hospital and community pharmacy settings. However, technological advancements have enabled pharmacists to provide care through telehealth and virtual consultations, allowing greater accessibility and flexibility for patients, especially in remote areas or for those with mobility issues [14].

Each method of delivery comes with its own set of challenges and benefits. Face-to-face consultations provide an opportunity for in-depth, personalized patient interactions, allowing pharmacists to address concerns directly and monitor patient responses. However, this approach may not always be feasible, especially in under-resourced areas or during healthcare system strain, such as the COVID-19 pandemic [15].

Telehealth and virtual consultations have become increasingly popular in recent years, offering a convenient alternative for patients to consult with pharmacists remotely. While these methods give the advantage of accessibility and convenience, they may limit the ability to perform physical assessments or offer hands-on counseling. Despite these limitations, telehealth has proven effective in managing DTPs, particularly in ambulatory care settings, where patients can be monitored through regular check-ins and medication reviews [16].

It is essential to implement systematic processes for reviewing patient care, regardless of the method used. Whether in person, via telephone, or virtual platforms, the quality of the pharmaceutical care provided can vary significantly if no strategic plan or quality control standardization comes into play.

Quality and productivity

In cases where there are no set guidelines for handling a task and any manager pulls in a group of random people from the street, set them up. It works and expects to get a fantastic result. At best, the output looks like an uncoordinated and chaotic effort which consists of discharge of duties on a daily, weekly, monthly, or yearly basis to ensure smooth running. If the processes undertaken are not standardized, then there will be some measure of chaos. Every profession therefore requires rules that define the scope, quality, and processes followed. The rules and "modus operandi" in pharmaceutical care delivery need to be standardized to have visibility over ensuring quality [18-19].

Process standardization

This fundamentally describes the establishment of a set of rules governing how people in a setting are expected to complete a given task. This can be applied to any task; even answering a phone call, and taking down a client's information. Already the content and functions a pharmacist performs are well understood, the primary concern now is the method that will foster consistency in the provision of pharmaceutical care and support continuity of care both within a practice setting (e.g. pharmacists on different work shifts) and among practice setting (e.g. on discharge to home or ambulatory care). The basic issue here is what the sequence in the protocol is and for each step how this proceeds [20].

Variability in practice

Nature and style of practice by third-year post-graduation pharmacists in hospital or community as a fully registered professional (i.e. first year and second year being internship and national youth service years, respectively) tell a lot about variability in service delivery [21-22]. He is sometimes not under any senior or mentor, so he is believed to be able to discharge duties based on his undergraduate training and the experience gathered during the 2-years postgraduate life. Different strokes for different folks exist as some persons have the first year post-graduation experience in the academic or hospital or community setting while the second year in another of these and finally settles for a completely different area of practice, not by design but fate. In all these sway areas, it suffices to state that no fundamental standardized system exists. For example, in a hospital setting e.g. tertiary institution and secondary health facility, the standard of care is not homogenous, approaches to care of clients vary widely most likely depending on the situation facility, and where a strongly willed mentor exists, the personality comes into play. A standardized professional care approach is being advocated that transcends all of these variable

being the immediate necessary action (e.g., the addition of another drug, rectification of incomplete prescription, change of drug or dosage discontinuation of a particular offending drug, removal of an unnecessary drug, and other systematic and standardized protocols [24].

The resolution or intervention similarly requires a format of protocol that are consistent and homogenous. In most cases, the resolution outcomes of the DTP will also need a predefined and standardized approach. The outcome of the intervention (accepted as observed, requires a change, maintained and dispersed as previously written) is expected to pass through a regimented protocol, for finality [25].

The process of reporting of the observed intervention before treating the patient is somewhat of a controversial issue. It is assumed that the prescriber must give his consent to the superiority of the argument presented in the intervention. It appears sometimes that no matter how superior and valid the point in the intervention stands, the patient is assertively the prescriber's patient. In a standardized practice in all settings, the protocol for the clarification and resolution must be established and standardized [26].

The role of standardization in pharmaceutical care

The verb "standardized" refers to the process of making products, services, or rules conform to a particular model or set of guidelines. In the context of pharmaceutical care, standardization involves the development and implementation of consistent protocols, practices, and technologies to ensure that all patients receive high-quality, evidence-based care (American Society of Health-System Pharmacists, 1999).

Standardization in pharmaceutical care can take many forms, from uniform medication therapy management protocols to standardized drug formularies. The primary goal of standardization is to reduce variation in the delivery of care, ensuring that all patients receive the same level of quality regardless of the healthcare setting. This approach not only promotes consistency but also improves patient safety by minimizing the risk of medication errors and DTPs [27].

Standardization is important in the context of DTP resolution. By adopting standardized protocols for assessing and managing DTPs, healthcare organizations can ensure that pharmacists approach patient care in a systematic, evidence-based manner. For example, use of standardized medication review templates can help pharmacists identify common DTPs, such as drug-drug interactions or dosing errors, and take appropriate action to address them. Similarly, standardized training programs for pharmacists can

The benefits and challenges of standardizing pharmaceutical care

There are numerous benefits to standardizing pharmaceutical care, particularly in addressing DTPs. One of the key advantages is that standardization helps reduce ambiguity and guesswork in clinical decision-making. When pharmacists follow well-established protocols, the likelihood of errors decreases, and the consistency of care improves. This can lead to better therapeutic outcomes for patients and greater satisfaction with the healthcare system.

Moreover, standardized practices help streamline workflows, increase productivity, and improve resource allocation [29]. In a busy hospital or community pharmacy, standardized processes allow pharmacists to focus on delivering care rather than passing time for determining the best course of action for each patient. This not only saves time but also ensures that pharmacists' expertise is applied consistently across all patients.

However, the process of standardization is not without its challenges. One of the primary obstacles is the variation in healthcare settings, where differences in resources, patient populations, and local regulations may make it difficult to implement a universal standard. For instance, what works in a large, well-funded hospital may not be feasible in a rural community pharmacy with limited resources. Additionally, resistance to change among healthcare professionals can be a significant barrier to successful implementation of standardized practices [30].

Despite these challenges, the movement toward standardization in pharmaceutical care is gaining momentum globally. Standardized care frameworks have been shown to improve patient outcomes in various settings, and the adoption of such frameworks by pharmacy organizations is crucial to ensuring that patients receive safe, effective, and high-quality care.

The identification and resolution of drug therapy problems (DTPs) are essential components of pharmaceutical care that can significantly improve patient outcomes and reduce the harm associated with medications. Pharmacists play a central role in this process by reviewing prescriptions, assessing patients' drug regimens, and intervening to resolve any identified issues. However, the variability in the delivery of pharmaceutical care across different healthcare settings underscores the need for standardization in the approach to DTP management.

Standardization offers a promising solution to ensuring consistency and quality in pharmaceutical care. By developing and implementing standardized protocols, healthcare organizations can reduce the risk of DTPs, enhance patient safety, and improve overall healthcare outcomes. While there are challenges to implementing standardized practices, the benefits of a

approach to pharmaceutical care are clear. Standardization not only reduces variation in clinical decision-making but also promotes efficiency, improves patient satisfaction, and enhances the overall quality of care delivered [31].

The future of pharmaceutical care lies in the continued development of standardized practices that can be adapted to diverse healthcare settings. As pharmaceutical care continues to evolve, the need for robust, evidence-based protocols that guide the identification and resolution of DTPs will be essential to improving patient care globally.

Pharmaceutical care functions

The standardized system should include core functions such as collecting and organizing patient-specific information alongside determining the presence of medication-therapy problems, summarizing patients' healthcare needs, specifying pharmacotherapeutic goals, designing a pharmacotherapy regimen, designing a pharmacotherapy regimen and corresponding monitoring in collaboration with the patient and other health professionals [32].

Initiating the pharmacotherapy regimen and monitoring plan

The above was adapted from the pharmacotherapy series of the ASHP clinical skills programme and the final report of the ASHP model for Pharmacy Practice Research Learning Demonstration Project [33].

The determination of presence of DTP and subsequent conclusion is expected of medication, disease, laboratory test, and patient-specific information. With these in mind, the prescriptions for patients should be assessed for medication-therapy problems systematically under the headings of scrutiny such as: Are there any medical induction for this drug? Is there any drug prescribed? Is this drug appropriately prescribed for a medical condition? Are these medication dose, dosage form, schedule, route of administration, methods of administration appropriate? Any therapeutic duplication? Any there allergic reactions to the medications? Are there any possible actual and potential adverse drug events? Any actual and potential clinically significant drug-drug, drug nutrient and drug-laboratory test interactions?; Any possible interference with medical therapy by social or recreational drug use? Is there any problem arising from the financial impact of medication therapy on patients? Any possible reason for not receiving the full benefit of prescribed medication therapy?

Posing these "Any" questions will require careful structural arrangements and standardized protocols for probing, receiving, processing and taking necessary action toward maximizing patients' benefit [34]. Taking necessary action in the event of intervention also requires a standardized approach. Questions such "do I meet the prescriber? Can I change the prescription to meet appropriate patient's need?

Documenting of pharmacist's intervention has to be standardized. A documentation protocol needs to be developed, if necessary by the pharmacists' regulatory council and other stakeholders and promoted as a tool for effective pharmaceutical care in the various settings. The importance of pharmacists' checklist and worksheet in patients' folders alongside nurses' and physicians' entries cannot be underestimated. A curriculum that emphasizes a standardized and harmonized protocol in this regard is belated in the country. The curriculum should specify on the worksheet a summarized patient's healthcare need, the specific pharmacotherapeutic goals, and desired outcome [35].

Collecting and organizing pertinent patent-specific information will help form a database for the practice and prevent, detect, and resolve patient's medication-related problems to make appropriate medication-therapy recommendations [36]. When the database is not available in any setting, what kind of impute can any pharmacist make that can reasonably add to the value of care? Demographic e.g. name, address, date of birth, sex, religion, occupation, medical details (weight and height, acute and chronic medical problems, current symptoms, vital signs and other monitoring information, allergies and intolerances, past medical history) laboratory information, diagnostic and surgical procedures, medication therapy (prescribed medications, non-prescription medications, medication used prior admission, home remedies and other types of health products, medication allergies and intolerances and other concerns [37]

The manner of systematically collecting the information, storing the data, and retrieving it for pharmaceutical care judgment is expected to be standardized in the various care settings. It is believed that the homogeneity or similarity of care practice in different settings will promote the image of the profession. In developed settings, the record system is favoured by the constant electricity supply. Electronic medication record system makes things easier and gives access to patient medication records or profiles [38].

Since the introduction of the pharmaceutical care concept, considerable variation in pharmacists' provision of pharmaceutical care has been observed in acute care (hospital), ambulatory care, home care, long-term care (hospital), and other practice settings. The extent of standardization will therefore depend on every given work site and practice environment.

The American Society of Health-System Pharmacists (ASHP) guidelines

The ASHP guidelines provide a comprehensive

systems. These guidelines are essential in promoting patient safety, optimizing medication therapy, and ensuring the efficient operation of pharmacy services [39].

The key areas covered by the ASHP guidelines are briefly examined in this review.

Medication safety and error prevention

ASHP guidelines emphasize the importance of a culture of safety in health systems, focusing on reducing medication errors through error reporting systems to track and address medication-related incidents, standardized protocols for medication preparation, dispensing, and administration to minimize the risk of human error, the use of technology, such as computerized physician order entry (CPOE), barcode scanning, and automated dispensing cabinets (ADC), all geared towards enhancing accuracy in medication use [41].

Pharmacist's role in patient care

The guidelines highlight the expanding role of pharmacists in direct patient care. The key recommendations include pharmacist-led patient education on medication usage, side effects, and adherence, pharmacists' participation in multidisciplinary teams, providing expertise in pharmacotherapy management, drug interactions, and monitoring, pharmacists' involvement in clinical decision-making, especially in complex drug regimens like those involving oncology, pediatrics, and critical care, sterile and non-sterile compounding [42]. The guidelines provide and spell out specific protocols for aseptic techniques in sterile compounding (e.g., chemotherapy, parenteral nutrition) and non-sterile compounding (e.g., creams, ointments). The guidelines focus on maintaining clean and controlled environments for compounding, following Good Manufacturing Practices (GMP) for sterile and non-sterile products, and ensuring appropriate storage and labeling of compounded products to avoid contamination and misuse [43].

Pharmaceutical care in special populations

ASHP guidelines also emphasize personalized pharmaceutical care for specific populations, such as in paediatrics addressing the unique pharmacokinetic and pharmacodynamic considerations in children, geriatrics: focusing on polypharmacy, drug-drug interactions, and adjusting medications for age-related physiological changes, in pregnancy and lactation ensuring that drug therapies are safe for expectant or breastfeeding mothers [44].

Pharmacy staffing and resource allocation

The guidelines offer recommendations for adequate staffing levels, training, and professional development to ensure that health-system pharmacists are equipped to handle complex and evolving demands. This includes ensuring sufficient pharmacists per patient ratio to maintain high-quality care, alongside continuous education and certification programs to keep up with advancements in pharmacotherapy and emerging drug therapies [45].

Drug shortages and medication management

ASHP guidelines provide strategies for dealing with drug shortages, a common issue in healthcare settings, which can compromise patient care. Suggested measures include alternative therapy options for patients during shortages, collaborating with manufacturers and distributors to manage and mitigate shortages, and developing inventory management strategies to maintain an uninterrupted supply of essential drugs [46].

Quality Assurance and continuous improvement

The guidelines advocate for ongoing quality improvement programs within pharmacy departments, with focus on regular audits of medication usage and dispensing practices, using data to inform and improve clinical pharmacy services, and engaging in benchmarking with other institutions to identify best practices and opportunities for improvement [47].

Ethical and legal considerations

ASHP guidelines stress the importance of pharmacists practicing within the legal and ethical framework of the profession. This includes ensuring patient confidentiality and handling personal health information appropriately, adhering to federal and state regulations governing the distribution and use of controlled substances, and providing ethical guidance in situations where drug therapy may be controversial or where patient autonomy in conflict with clinical recommendations [48].

Pharmacovigilance and drug monitoring

Monitoring drug safety post-market is a key component of ASHP's guidelines. Pharmacists are encouraged to: Participate in pharmacovigilance programs, collecting data on adverse drug reactions (ADRs) and reporting them to regulatory bodies like the FDA, Monitor drug efficacy through therapeutic drug monitoring (TDM), ensuring that patients are receiving optimal doses for their conditions [49].

Pharmacy practice training and curricular

There are over twenty schools of pharmacy in Nigeria with different nomenclature for the department where pharmacy practice and training in pharmaceutical care are offered. The variation in the nomenclature is a sign of the focus of training and emphasis area. This explains why there are lapses and the problems confronting the concept of standardized practice [50].

The National Universities Commission Benchmark is merely to guide in developing the courses to instruct students who wants to study to become pharmacists. A professional guideline that emphasizes a standardized

practice is therefore required to give a one-product service delivery across the various practice setting. Currently, we have a system approach to schools that treats subjects as objects. As Aristotle says "education is a political issue", other interests have taken the content of the curriculum government determined curriculum spells out what schools should be doing and how they should be doing it. A standardized curriculum is the idea that all schools nationwide set the curriculum that they teach to their students so each one will be on the same level as the other [51].

Challenges to the effective discharge of PC

The barriers to establishing a direct relationship with the patient during pharmaceutical care are multi-faceted. The patient's need and desired outcome can only be established sometimes with the impute of the family members, caregivers, and other members of the healthcare team. In some community settings, pharmacists do not have access to hospital records for continuity of care. The data for monitoring of medication therapy need to be available with an understanding within organizations (formal and informal). A standardized protocol therefore needs to be in place. This may be from community practice to hospital and vice-versa [52].

It is ideal to have a comprehensive database for all patients. The health system's policies and procedures, therefore, should aim at a standardized method of storage and retrieval of patient information for a consistent and informed practice [53].

The system of recording patient-specific data has been found to vary widely depending on the practitioners' preferences and practices setting. A standardized protocol for adding information to the patient's health record should be established for continuity-of-care.Information on patient's health records is meant to be accessed from different professionals. The system operating now does not allow coordinated access to a comprehensive view for a full discharge of responsibility. After all, the healthcare concept is a wholesome focus [55].

Conclusion

The ASHP guidelines aim to support health-system pharmacists in delivering the highest standard of patient care by focusing on safety, efficiency, and quality. Through these comprehensive guidelines, ASHP provides a roadmap for integrating pharmacists into patient care teams, enhancing the use of medications, and improving overall healthcare outcomes. The guidelines also advocate for a proactive approach to emerging challenges, such as drug shortages and counterfeit drugs, helping to ensure that patients receive safe, effective, and timely care.

Ethical Consideration

Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request. All data supporting the findings of this study have been included within the article and its supplementary materials, where applicable.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Compliance with ethical guidelines

This study was conducted in accordance with ethical standards as outlined in the Declaration of Helsinki and/or relevant institutional and national research committee guidelines. Ethical approval was obtained from the appropriate institutional review board, and informed consent was obtained from all individual participants included in the study.

Authors' contributions

All authors contributed significantly to the conception, design, execution, and/or interpretation of the research. Author SOA was responsible for the conceptualization, methodology, data collection, Author JIA handled data analysis and interpretation, and Author AEA contributed to the drafting and revising of the manuscript. All authors reviewed and approved the final version of the manuscript.

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