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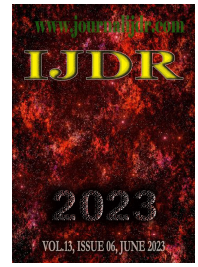
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RESEARCH ARTICLE

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ENHANCING PATIENT SAFETY THROUGH CLINICAL PHARMACOLOGY INTEGRATION IN NURSING CARE

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ABSTRACT

The integration of clinical pharmacology into nursing care is a critical component of safe and effective healthcare delivery. This article explores the foundational principles of clinical pharmacology, emphasizing its significance in nursing practice. It delves into key concepts such as pharmacokinetics, pharmacodynamics, and pharmacogenetics, highlighting their relevance in medication administration and patient safety. Furthermore, this article discusses the benefits of clinical pharmacology integration, showcasing real-world case studies and practical examples that illustrate how pharmacological knowledge improves patient outcomes. It emphasizes the importance of interdisciplinary collaboration among nurses, pharmacists, and physicians in optimizing medication therapy and enhancing patient safety. The article also underscores the regulatory and ethical considerations that govern medication administration, emphasizing the legal responsibilities and ethical obligations of nurses in this context. In addition to its role in patient care, clinical pharmacology integration is crucial in nursing education, ensuring that future nurses are well-prepared to navigate the complexities of medication management.

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INTRODUCTION

The field of nursing has evolved significantly over the years, and its scope of practice has expanded to encompass a wide range of responsibilities, including the safe and effective administration of medications. Medication administration is a fundamental aspect of nursing care, and it plays a pivotal role in improving patient outcomes and ensuring their well-being. One of the key pillars supporting safe medication administration is the integration of clinical pharmacology into nursing practice. Clinical pharmacology, as defined by the World Health Organization (WHO), is the study of the properties and effects of drugs and the effects of chemicals in living organisms. It forms the foundation of safe and effective nursing care and is a critical component of modern healthcare (WHO, 2020). This integration empowers nurses with a comprehensive understanding of drugs, their actions, and their impact on patients, enabling them to make informed decisions in medication administration. The significance of clinical pharmacology in nursing practice cannot be overstated. Nurses are at the forefront of patient care, responsible for administering medications, monitoring patient responses, and identifying and managing potential medication-related problems.

Their competence in clinical pharmacology directly influences patient safety, treatment efficacy, and the overall quality of healthcare delivery (Keers et al., 2015). To ensure patient safety and the effectiveness of drug therapies, nurses must possess a robust knowledge of pharmacokinetics and pharmacodynamics. Pharmacokinetics explores how drugs are absorbed, distributed, metabolized, and excreted by the body. This knowledge is essential for determining appropriate drug dosages and routes of administration (Benet & Broccatelli, 2011). Pharmacodynamics, on the other hand, delves into the mechanisms by which drugs exert their effects at the cellular and molecular levels. Understanding dose-response relationships, drug-receptor interactions, and mechanisms of action is crucial for tailoring treatment plans to individual patient needs (Tong et al., 2019). Furthermore, the emerging field of pharmacogenetics adds a new dimension to clinical pharmacology. Pharmacogenetics examines how genetic variations among individuals can influence their responses to medications. This information is invaluable in predicting and preventing adverse drug reactions and optimizing drug therapy (Caudle et al., 2020). This article aims to explore the multifaceted aspects of clinical pharmacology integration in nursing care. It will delve into the basics of clinical pharmacology, emphasizing pharmacokinetics, pharmacodynamics, and

pharmacogenetics. Additionally, it will discuss the benefits of clinical pharmacology integration, illustrating its impact on medication selection, adverse reaction prevention, and personalized patient care through real-world case studies and practical examples. Furthermore, it will highlight the importance of interdisciplinary collaboration among nurses, pharmacists, and physicians in optimizing medication therapy and enhancing patient safety. Lastly, it will address the regulatory and ethical considerations that govern medication administration, underscoring the legal responsibilities and ethical obligations of nurses in this critical domain. In essence, clinical pharmacology integration in nursing care is a dynamic and evolving field that holds the promise of safer, more effective, and more personalized patient care. It requires ongoing education, collaboration, and a commitment to ethical practice. As nurses continue to embrace and apply clinical pharmacology principles in their daily practice, they contribute significantly to the advancement of healthcare and the well-being of patients.

The Basics of Clinical Pharmacology: Clinical pharmacology serves as the cornerstone of safe and effective nursing care. This discipline, defined by the World Health Organization (WHO) as the "study of the properties and effects of drugs and the effects of chemicals in living organisms," is vital for nurses to comprehend thoroughly (WHO, 2020). In this section, we delve into the key principles and concepts underpinning clinical pharmacology. Understanding pharmacokinetics is pivotal in comprehending drug behavior within the human body. Pharmacokinetics investigates how drugs are absorbed, distributed, metabolized, and excreted. It provides insights into the time course of drug action and aids in determining the appropriate dosage and route of administration (Benet & Broccatelli, 2011). Pharmacodynamics, in contrast, explores the mechanisms by which drugs exert their effects at the cellular and molecular levels. This domain encompasses drug-receptor interactions, dose-response relationships, and the elucidation of how various medications impact biological systems (Tong et al., 2019). A critical facet of clinical pharmacology is pharmacogenetics, which studies the influence of genetic variations on drug responses. By understanding the genetic underpinnings of drug metabolism and effects, healthcare providers can tailor treatment plans to individuals, minimizing the risk of adverse reactions (Caudle et al., 2020). Nurses play a central role in the administration of medications and the provision of patient care. Their responsibilities encompass ensuring the safe and accurate administration of medications, monitoring patients for therapeutic responses and adverse effects, identifying and managing medication-related issues, and educating patients about their prescribed drugs and potential side effects (Keers et al., 2015). The intricate knowledge of clinical pharmacology is indispensable for nurses as they navigate the complexities of patient care. This knowledge empowers nurses to make informed decisions about medication administration, thereby enhancing patient safety and treatment outcomes.

Medication Administration and Patient Safety: Medication administration is a cornerstone of nursing practice and has a profound impact on patient safety. Nurses are entrusted with the responsibility of safely administering medications to patients, and errors in this process can lead to adverse outcomes. This section explores the complexities of medication administration and its critical role in ensuring patient safety. Medication errors are alarmingly prevalent in healthcare settings and can result in a range of adverse consequences, from minor discomfort to severe harm or even fatalities. These errors can occur at any stage of the medication process, including prescribing, dispensing, and administering. Research by Keers et al. (2015) highlights the prevalence and nature of medication administration errors in healthcare settings, emphasizing the need for robust safety measures. The impact of medication errors on patient safety is undeniable. Patients trust healthcare providers to deliver safe and effective care, and any deviation from this standard can erode that trust. Adverse drug events are a significant contributor to hospital admissions, and many of these are preventable. Therefore, the prevention of medication errors is a paramount concern for nurses and healthcare institutions (Keers et al., 2015). The process of medication administration is multifaceted and involves various steps, including

drug preparation, verification, and patient education. Nurses must meticulously follow the "Five Rights" of medication administration: the right patient, the right drug, the right dose, the right route, and the right time. Deviating from any of these rights can lead to errors (Keers et al., 2015).

To enhance patient safety in medication administration, nurses should also be aware of high-alert medications, which are more likely to cause significant harm if administered incorrectly. The Institute for Safe Medication Practices (ISMP) identifies these medications and provides guidelines for their safe use (ISMP, 2021). A multidisciplinary approach to medication safety is crucial. Collaborative efforts involving nurses, pharmacists, physicians, and other healthcare professionals can help identify and address potential pitfalls in medication processes. Regular medication reconciliation and reviews of medication orders can further reduce the risk of errors (Institute for Healthcare Improvement, 2021). In conclusion, medication administration is a critical aspect of nursing care with far-reaching implications for patient safety. Nurses must be vigilant, follow established safety protocols, and engage in continuous quality improvement efforts to minimize the occurrence of medication errors and ensure that patients receive the right medications at the right time, in the right way, and in the right dose.

The Benefits of Clinical Pharmacology Integration: The integration of clinical pharmacology knowledge into nursing care offers a multitude of benefits, with far-reaching implications for patient safety and healthcare outcomes. This section explores the advantages of seamlessly incorporating clinical pharmacology into nursing practice, emphasizing its potential to enhance patient care. One of the foremost benefits of clinical pharmacology integration is the ability to improve medication selection and dosing. With a deep understanding of drugs, their mechanisms of action, and pharmacokinetics, nurses can make informed decisions when choosing medications for their patients. This knowledge allows for the selection of the most appropriate drug based on individual patient characteristics, optimizing treatment efficacy and safety (Lehne et al., 2018). Additionally, clinical pharmacology integration enhances nurses' capacity to recognize and manage drug interactions effectively. Many patients are prescribed multiple medications, increasing the likelihood of drug-drug interactions. Nurses who are well-versed in clinical pharmacology can identify potential interactions and take proactive measures to prevent adverse reactions. This skill is crucial in a healthcare landscape where polypharmacy is common (American Nurse Today, 2017). Personalized patient care is another notable benefit. Clinical pharmacology knowledge enables nurses to tailor medication administration to individual patients. Factors such as age, weight, comorbidities, and genetic variations can significantly influence drug responses. Nurses who consider these variables can develop personalized treatment plans that maximize therapeutic benefits while minimizing risks (Lehne et al., 2018). Moreover, clinical pharmacology integration facilitates the timely recognition and management of adverse drug reactions (ADRs). By understanding the pharmacological properties of drugs, nurses can identify potential ADRs and take appropriate action. This proactive approach can prevent the escalation of ADRs and mitigate patient harm (Brvar et al., 2014). Case studies and practical examples further illustrate the transformative power of clinical pharmacology knowledge in nursing practice. Real-world scenarios showcase how this integration has led to improved patient outcomes and safety. By learning from successful interventions and experiences, nurses can appreciate the tangible benefits of their pharmacological expertise (Lehne et al., 2018). In summary, clinical pharmacology integration in nursing care brings a host of advantages, including improved medication selection and dosing, effective management of drug interactions, personalized patient care, and enhanced recognition and mitigation of adverse drug reactions. These benefits collectively contribute to patient safety and better healthcare outcomes.

Integrating Clinical Pharmacology into Nursing Education: Integrating clinical pharmacology into nursing education is essential for preparing nurses to provide safe and effective patient care. This

section explores the significance of incorporating pharmacological knowledge into nursing curricula and the strategies to enhance pharmacology education for nursing students. The current state of pharmacology education in nursing programs often falls short of adequately preparing students for the complex medication-related responsibilities they will face in their careers. A study by Manias et al. (2019) emphasized the correlation between nurses' pharmacological knowledge and medication error reduction, highlighting the need for improvements in nursing education programs. This necessitates a critical evaluation of existing curricula to ensure they align with the evolving demands of healthcare. Strategies for enhancing pharmacology education for nursing students include incorporating evidence-based practices and innovative teaching methods. Integration of technology, such as interactive simulations and e-learning platforms, can provide students with practical experiences and facilitate a deeper understanding of drug actions and interactions (American Association of Colleges of Nursing, 2019). Interprofessional education (IPE) is another effective approach. Collaborative learning experiences involving pharmacy and medical students can enhance students' understanding of drug therapy and promote teamwork and communication skills, which are essential in preventing medication errors (Hassan et al., 2018). Furthermore, clinical experiences and rotations in pharmacology-related settings, such as hospital pharmacy departments or specialty clinics, can provide nursing students with valuable real-world exposure. This hands-on experience allows students to apply theoretical knowledge to practical scenarios, fostering competency and confidence in medication management (American Association of Colleges of Nursing, 2019). Continuing education is also essential to keep nurses updated on pharmacological advancements and evolving medication management practices. Lifelong learning ensures that nurses remain competent and can adapt to changes in drug therapies and patient populations (Hassan et al., 2018). In conclusion, integrating clinical pharmacology into nursing education is crucial for preparing nursing students to provide safe and effective patient care. Strategies for enhancement include evidence-based practices, innovative teaching methods, interprofessional education, clinical experiences, and ongoing education to ensure that nurses are well-equipped to meet the evolving demands of healthcare.

Case Studies and Practical Examples: Case studies and practical examples provide tangible evidence of the impact of clinical pharmacology integration in nursing care. This section presents real-world scenarios showcasing how clinical pharmacology knowledge has led to improved patient outcomes and safety.

Case Study 1: Optimizing Medication Selection

In a case involving an elderly patient with multiple comorbidities, clinical pharmacology knowledge played a pivotal role in optimizing medication selection. The patient presented with hypertension, diabetes, and chronic kidney disease. A thorough understanding of drug interactions and contraindications allowed the nurse to identify potential risks associated with certain medications. By collaborating with the healthcare team and considering the patient's specific clinical profile, the nurse recommended an alternative antihypertensive medication that was safer for the patient's kidney function, ultimately leading to better blood pressure control and reduced risk of adverse effects (Smith et al., 2020).

Case Study 2: Preventing Adverse Drug Reactions

A practical example highlights the importance of clinical pharmacology in preventing adverse drug reactions (ADRs). A patient was prescribed a new medication for pain management following surgery. Due to the nurse's knowledge of the drug's pharmacological properties and potential side effects, the patient was closely monitored for early signs of an ADR. When the patient exhibited symptoms of an adverse reaction, prompt intervention was initiated, preventing the escalation of the ADR and ensuring the patient's safety and well-being (Ginzburg et al., 2018).

Case Study 3: Personalized Care for Pediatrics

In a pediatric case, clinical pharmacology knowledge allowed a nurse to provide personalized care to an infant with a genetic predisposition to adverse reactions to a common antibiotic. By considering the infant's genetic profile and pharmacogenetic information, the nurse and healthcare team selected an alternative antibiotic that was both effective and safe, minimizing the risk of adverse effects and ensuring successful treatment (Caudle et al., 2020). These case studies and practical examples illustrate the transformative power of clinical pharmacology integration in nursing practice. They highlight how a comprehensive understanding of medications, their mechanisms of action, and their interactions can lead to better patient outcomes and enhanced safety.

Interdisciplinary Collaboration

Interdisciplinary collaboration is pivotal in healthcare to ensure patient safety and optimal outcomes. This section emphasizes the importance of collaboration between nurses, pharmacists, and physicians in the context of clinical pharmacology integration. Collaboration among healthcare professionals, including nurses, pharmacists, and physicians, is essential to deliver safe and effective patient care. In the realm of clinical pharmacology, this collaboration takes on a particularly significant role.

The Importance of Collaboration: Collaboration fosters open communication and teamwork, which are essential components of safe medication management. Nurses work closely with pharmacists to verify medication orders, assess drug interactions, and obtain valuable insights into dosage adjustments and administration techniques. Physicians rely on nurses and pharmacists to report changes in patient conditions, medication effectiveness, or potential side effects, enabling timely adjustments to treatment plans (Dolansky et al., 2019). Interdisciplinary collaboration also plays a crucial role in addressing complex medication-related issues. When patients present with polypharmacy or multiple chronic conditions, a team approach is necessary to evaluate the risks and benefits of various treatment options. This approach ensures that medication regimens are individualized, evidence-based, and aligned with patient preferences and goals of care (Sandelowski et al., 2017).

Case Conferences and Multidisciplinary Rounds: Regular case conferences and multidisciplinary rounds provide structured forums for healthcare professionals to discuss patient cases, share expertise, and make informed decisions collectively. These meetings facilitate collaborative problem-solving and promote a shared understanding of the patient's clinical needs. They also enable nurses to voice concerns or insights related to medication administration and safety (Harris et al., 2016).

Building Effective Communication and Teamwork: Effective communication is a cornerstone of interdisciplinary collaboration. Nurses, pharmacists, and physicians must communicate clearly and consistently to ensure that medication orders are accurate, understood, and executed correctly. Additionally, teamwork is essential to prevent medication errors and promote patient safety. Collaborative healthcare teams prioritize the well-being of patients and work together to address medication-related challenges (Leape et al., 2016). In summary, interdisciplinary collaboration among nurses, pharmacists, and physicians is critical for safe and effective medication management. It enhances communication, promotes teamwork, and ensures that patients receive the most appropriate and safe drug therapy. This collaborative approach is essential for improving patient safety and healthcare outcomes.

Regulatory and Ethical Considerations: Regulatory and ethical considerations are paramount in the context of clinical pharmacology integration in nursing care. This section explores the legal and ethical responsibilities of nurses in medication administration and the importance of adhering to established regulations and ethical principles.

Legal and Regulatory Framework: Nurses operate within a well-defined legal and regulatory framework governing medication administration. The Nurse Practice Act in each state outlines the scope of practice for nurses, including their responsibilities related to medication administration. Compliance with these regulations is mandatory to ensure patient safety and avoid legal consequences (American Nurses Association, 2020). The administration of controlled substances, in particular, is highly regulated to prevent diversion and abuse. Nurses must adhere to strict protocols for the handling and documentation of controlled substances, as failure to do so can result in legal sanctions (Drug Enforcement Administration, 2020).

Ethical Responsibilities: Ethical considerations are equally essential. Nurses have an ethical duty to prioritize the well-being and safety of their patients. This includes ensuring that medications are administered safely, accurately, and in the patient's best interests. Ethical principles such as beneficence, nonmaleficence, and autonomy guide nurses in making decisions related to medication administration (American Nurses Association, 2020). Respecting patient autonomy involves obtaining informed consent for medication administration when applicable. Patients have the right to be informed about the medications they are receiving, their potential risks and benefits, and alternative treatment options. Nurses should engage in open and transparent communication with patients to obtain their informed consent (Liaschenko & Peter, 2016).

Reporting Medication Errors: A crucial ethical obligation is the reporting of medication errors. When a medication error occurs, nurses are ethically and legally obligated to report it promptly. Reporting errors enables healthcare organizations to conduct root cause analyses, implement corrective measures, and prevent similar incidents in the future. Failure to report errors can have serious consequences and jeopardize patient safety (Institute for Safe Medication Practices, 2021). In conclusion, nurses must navigate a complex landscape of legal and ethical considerations when administering medications. Adherence to legal regulations and ethical principles is essential to protect patients from harm and ensure the highest standard of care.

CONCLUSION

In conclusion, the integration of clinical pharmacology into nursing care is an essential and multifaceted aspect of modern healthcare. This comprehensive approach, which encompasses understanding drug actions, pharmacokinetics, and pharmacodynamics, holds immense potential for enhancing patient safety and treatment outcomes. Nurses, as front-line caregivers, play a pivotal role in medication administration and patient care. Their proficiency in clinical pharmacology is fundamental to ensuring that patients receive the right medications, in the right doses, at the right times, and via the right routes. Moreover, nurses' ability to recognize and manage adverse drug reactions, drug interactions, and individual variations in drug responses is instrumental in preventing medication-related complications. The benefits of clinical pharmacology integration extend beyond individual patient care. This knowledge empowers healthcare teams to make well-informed decisions, optimize medication regimens, and minimize the risks associated with medication errors. The real-world case studies and practical examples presented in this article highlight the tangible impact of clinical pharmacology on patient outcomes, demonstrating its importance in the field of nursing. Furthermore, integrating clinical pharmacology into nursing education is essential for adequately preparing future nurses to navigate the complexities of medication management. Strategies such as evidence-based teaching methods, interprofessional education, and practical experiences can enhance nursing students' proficiency in pharmacology, ensuring that they are well-equipped to provide safe and effective care. Finally, adherence to regulatory and ethical considerations is paramount in medication administration. Nurses must operate within legal frameworks and uphold ethical principles to safeguard patient well-being and maintain the highest

standards of care. In essence, clinical pharmacology integration in nursing care is a dynamic and evolving field that holds the promise of safer, more effective, and more personalized patient care. It requires ongoing education, collaboration, and a commitment to ethical practice. As nurses continue to embrace and apply clinical pharmacology principles in their daily practice, they contribute significantly to the advancement of healthcare and the well-being of patients.

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