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IMPROVING PATIENT SAFETY IN HEALTHCARE: A COMPREHENSIVE APPROACH FROM PHARMACY, LABORATORY, RADIOLOGY AND NURSING TEAMS

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ABSTRACT

Introduction: The Institute ofMedicine objectives for the healthcare sector in terms of safety, effectiveness, patient-centeredness, efficiency, timeliness, and equality have not yet been met. The skills needed to provide high-quality healthcare are not adequately taught in current professional curricula, especially for pharmacy, laboratory, nursing and radiology professionals who will soon be entering thefield.

Aim of work: To provide a comprehensive assessment of the roles pharmacy, laboratory, radiology and nursing teams in improving patient safety in Healthcare.

Methods: We conducted a comprehensive search in the MEDLINE database's electronic literature using the following search terms: pharmacy, laboratory, radiology, nursing teams, improving, patient, safety, Healthcare. The search was restricted to publications from 2016 to 2021 in order to locate relevant content. I performed a search on Google Scholar to locate and examine academic papers that pertain to my subject matter. The selection of articles was impacted by certain criteria for inclusion.

Results: The publications analyzed in this study encompassed from 2016 to 2024. The study was structured into various sections with specific headings in the discussion section.

Conclusion: The role of pharmacists in patient safety is expected to grow as prescription errors remain a significant concern. They can play a crucial role in reducing adverse occurrences and enhancing healthcare safety. Clinicians play a vital role in reducing errors before laboratory analysis. Training programs can enhance specimen collection quality. Incorporating laboratory experts in clinical rounds, patient safety committees, and training seminars can facilitate information sharing. A comprehensive plan of action is essential to increase awareness of radiation hazards andfacilitate the dissemination of education. Nurses play a crucial role in patient safety, influenced by their work environment and supervisor support. Nurse leaders can cultivate a culture ofpatient safety and improve clinical outcomes by effectively managing these issues.

Keywords: Pharmacy, Laboratory, Radiology, Nursing Teams, Improving, Patient, Safety, Healthcare.

INTRODUCTION

Globally, the occurrence rate of events is seen as a significant issue for patient safety and the quality of treatment provided. Based on forecasts by the World Health Organization, 10% of patients in developed countries get injuries during their hospital stay (World Health Organization, 2021).

A precise definition of patient safety may be found in WHO's proposed International Classification for Patient Safety (ICPS). Patient safety, as defined by the ICPS, is reducing to a manageable level the risk of damage or injury related to receiving healthcare. While error refers to a mistake, an unintentional action, or the improper execution of a plan, risk is the possibility that an occunence may occur. According to Mitchell et al. (2016), adverse events are defined by the ICPS as any damage or injury that results from a patient's interaction with the healthcare team.

Six global patient safety goals were put into effect in 2016; they included improved surgical safety, safe medication administration, effective communication, and correct patient identification to reduce the risk of infection and patient falls (Slawomirski et al., 2017). To find ways to incorporate these abilities into healthcare practitioners' training, the IOM hosted the Health Professions Education Summit in 2002. Ensuling patient safety, improving healthcare quality, and addressing delivery flaws were the objectives. To provide high-quality healthcare, all aspiring healthcare professionals need to have these five fundamental abilities. These skills include using quality improvement techniques, applying evidence-based medicine, using the right information technology, providing patient-centered care, and working well in an interdisciplinary team. Health professionals today, including those in radiology, medical laboratories, pharmacies, nursing, and other fields, are not adequately prepared throughout their clinical training to gain the fundamental knowledge and abilities needed to provide high-quality healthcare (Albarqouni et al., 2018).

A patient safety committee is necessary to enhance the safety culture in hospitals, oversee and incorporate observations and efforts, cultivate knowledge, promote improvement initiatives, and safeguard resources. In order for hospital administrators and the medical community to successfully establish a "cultural fit," the committee plays a vital role in developing strategies for cultural transformation. The divergent professional cultures of these two groups often impede effective collaboration inside the organization. It is crucial to avoid any misunderstanding about the responsibilities and obligations of doctors in improving patient safety (Dekker, 2016). An effective patient safety committee should include of distinguished physicians, nurses, and administrators (including top-level medical, nursing, and executive officers), a safety officer, infection control staff, and individuals who are knowledgeable and respected among their colleagues. Robust hospital leadership and a collective vision are necessary for transforming a

culture, or simply modifying a few behaviors and rules (Pronovost et al., 2016). Therefore, the provision of management help is of utmost importance in ensuring patient safety.

AIM OF WORK

To provide a comprehensive assessment of the roles pharmacy, laboratory, radiology and nursing teams in improving patient safety in Healthcare.

METHODS

A comprehensive search was conducted on recognized scientific platforms, including Google Scholar and Pubmed, using specific keywords such as pharmacy , laboratory, radiology, nursing teams, improving, patient, safety, Healthcare.

The aim was to gather all relevant research papers. The articles were chosen according to certain criteria. Upon conducting a comprehensive analysis of the abstracts and notable titles of each publication, we eliminated case reports, duplicate articles, and publications without full information. The reviews included in this research were published from 2016 to 2021.

RESULTS

The current investigation concentrated on the roles pharmacy, laboratory, radiology and nursing teams in improving patient safety in Healthcare between 2016 and 2024. As a result, the review was published under many headlines in the discussion area, including: The importance of patient safety as a fundamental aspect of quality, Pharmacists' role in enhancing patient safety, The role of laboratory professionals in improving patient safety, Enhancing patient safety in radiology and Enhancing patient safety via the efficient use of nursing personnel.

DISCUSSION

1. The importance of patient safety as a fundamental aspect of quality.

According to the IOM's earlier research, there are three categories of quality issues: underuse (failure to provide a service that would have resulted in a positive outcome for the patient), overuse (potential harm from a service exceeds the potential benefit), and misuse (preventable complications that hinder patients from fully benefiting from a service).Abuse cases are generally addressed in the context of safety issues within the specified framework. Issues pertaining to both excessive and inadequate use are often addressed within the parameters of medicine as it is now understood (Hernandez et al., 2017).

The external environment's activities may be broadly divided into two groups: (1) legislative and regulatory actions; and (2) financial and other incentives or barriers. All forms of governmental regulations or legal actions, such as the liability system and licensing, are included in regulation and law. The combined actions of buyers and customers, the ethical standards and values of healthcare providers, and the national and local communities' cultural norms are just a few

examples of the many variables that make up economic and other incentives (Berwick and Cassel, 2020).

There are two different ways that legislation and regulation might affect the caliber of healthcare organizations. First off, it may make it possible for the CEO and governance of healthcare organizations to carry out internal quality improvement initiatives. An internal reaction is required to a call to action prompted by the external environment. Giving a poor response often has predetermined repercussions. In addition, it requires all healthcare facilities to devote a certain percentage of their resources to quality systems, guaranteeing an environment that is just and equal throughout the industry. It's also critical to recognize that rules and laws may sometimes act as a deterrent to upholding high standards, such as When they impose lax or inconsistent requirements (Frakes and Jena, 2016).

2. Pharmacists' role in enhancing patient safety

Pharmacists are modifying their position in healthcare to improve patient safety. Community pharmacists has the capacity to provide counseling services and participate in conversations on hazardous drug combinations, so potentially reducing the incidence Of adverse events and the need for hospital readmissions. Hospital pharmacists play a leading role in opioid stewardship efforts, which aim to reduce opioid usage and prevent adverse events (AES). Pharmacists are now being included into patient care processes, which involve the use of new approaches including pre-authorization drug request systems and the involvement of pharmacists in the development and assessment of prescription orders. This might lead to a reduction in medication errors and improved patient outcomes (Mansu, 2016).

Technology has expanded pharmacist roles and improved medication safety, but they must also address potential risks to patient safety. Automated dispensing cabinets in hospitals support efficient nursing response, but errors can occur. Remote pharmacist review is crucial for correct medication dispensement. Computerized provider order entry (CPOE) modules reduce the need for pharmacist review, but rule-based errors require pharmacist error checking. CPOE systems may increase workload, so suitability and limitations should be assessed and workarounds implemented to ensure a safe and efficient system (Shah, 2018).

Establishing a culture that prioritizes safety in clinical treatment is essential for safeguarding patient well-being. Pharmacists have a pivotal role in this endeavor as they provide valuable input to healthcare practitioners and enhance prescription methods. Although pharmacists face obstacles such as restricted scope of practice, lack of research on optimal methods, administrative complexities, IT compatibility issues, and patient involvement, there are prospects for innovative advancements in the field. There is a growing emphasis on a multidisciplinary, team-based approach to patient care, and it is anticipated that pharmacists will be integrated into the daily patient care team. Technological advancements, such as the use of robots in drug delivery, have the potential to decrease mistakes and enable pharmacists to concentrate on duties

related to pharmaceutical treatment management. With the expanding responsibilities of pharmacists, there is an increasing need to enhance the efficiency of machine learning and clinical decision support systems. Pharmacists, as discerning users of these resources, may play a crucial role in the design and assessment of implementation to ensure that their systems are used in the most effective manner (Schneider, 2018).

3.The role of laboratory professionals in improving patient safety

The Institute of Medicine study on quality of treatment highlighted a significant number of mistakes that led to patient damage and financial burden on the healthcare system. Significant advancements have been achieved in laboratory diagnosis, evident from the fact that mistake rates in laboratories are reduced compared to other areas of clinical healthcare (Plebani, 2016). Nevertheless, when the reliance on precise laboratory data increases in clinical decisionmaking processes, any errors made before the examination of the material are amplified, as was the case mentioned above. Laboratory errors are categorized into three types: pre-analytical, analytical, and post-analytical. It has been shown that pre-analytical and post-analytical errors contribute to over 70% of all errors in the laboratory (Lee, 2019).

Pre-analytic errors are categorized into errors occurring before, during and after specimen collection. Examples of pre-analytical errors ensuing prior to specimen collection include patient misidentification and inadequate patient preparation, while inadequate specimen volume collection or use of an inappropriate collection container represent pre-analytical errors taking place during sample collection. Specimen mislabeling is indicative of a pre-analytical error that transpires after specimen collection and reported at rates of 5 % (Schifman et al., 2018). However, this is likely an underestimation, as labelling errors can easily go undetected, especially in cases where labelling error occurs within the same specimen type (e.g. blood draws). Although recognition of a mislabeled CSF sample prevented inappropriate broadening Of antibiotics targeting a polymicrobial bacteriuria, the patient's hospitalization was unnecessarily prolonged in order to arrange a repeat LP and monitor him while off antibacterial therapy. For the patient's family, a prolonged hospitalization led to logistic and financial challenges with respect to coordinating transportation to be close to their newborn, care of their other children and lost wages from work absenteeism. The pre-analytical phase is complex, performed outside the laboratory and frequently performed by individuals with various levels of quality control training. Analogous to blood draws by phlebotomists, physicians who perfonn diagnostic procedures may benefit from teaching and access to written standard operating procedures for specimen handling to prevent pre-analytic error (Sandhu et al., 2017).

Labelling errors are an example of a non-conforming event (NCE), which are actions performed that are not in concert with an organization's policies, procedures or processes and have the potential to compromise the safety of patients or personnel and impact the efficiency and effectiveness of laboratory operations. Development of a nonconformity management system is necessary for implementation of any meaningful corrective measures. Any individual involved in

laboratory operations, ranging from physicians who perform diagnostic interventions on patients to laboratory technicians who interpret findings are encouraged to report any NCEs (Mulleta et al., 2021). Standardized forms are used to record details surrounding all NCEs such that a framework is provided for root-cause analysis to guide process improvement projects. In the case described above, it is unclear whether mislabeling the specimens represented a knowledge gap of an individual being unaware of labelling specimens in real-time or an indicator of a system problem in which the individuals involved in specimen collection and specimen labelling were different. Summary reports of NCE analysis require regular review to identify events of high priority for remedial, corrective, or preventative actions for process improvement. Analysis of NCEs following implementation of a particular improvement process serves to evaluate effectiveness of the procedure and provide an impetus for further adjustments. Importantly, NCE reporting forms, summary reports of NCEs and implementation protocols reacting to NCEs ought to be easily accessible to all individuals who perform laboratory operations, including those who collect and label specimens outside the laboratory (Sciacovelli et al., 2017).

4. Enhancing patient safety in radiology

"Radiation protection" refers to the essential measures taken to protect the environment and people from the risks caused by ionizing radiation. When it comes to medical imaging, computed tomography (CT) is the main area of concern about radiation exposure and its biological effects. In this perspective, modalities based on X-rays are very pertinent. Without a doubt, a significant amount of radiation exposure to the general public is caused by imaging procedures (Guide, 2018). Radiation effects may be divided into two primary categories: genetic effects that show up in the offspring and somatic effects that happen to the person who is exposed to radiation. Radiation impacts may also be further classified as stochastic effects, which do not have a threshold level, and deterministic effects, which have a threshold quantity of radiation exposure, such as burning. In radiology, the main concern with radiation exposure is the possibility of stochastic consequences. The aforementioned effects might be brought on by low-level ionizing radiation exposure, which is known to cause chronic illnesses including cancer and non-oncological diseases. According to the linear no-threshold concept, ionizing radiation exposure of any length may cause harm (Cardarelli and Ulsh, 2018).

Numerous studies have shown a little but significant increase in the risk of cancer development in children and young people who have previously had CT scans. Alongside this, there has been a detectable increase in the radiation damage done to DNA throughout different radiologic procedures (Goodman et al., 2019). However, a number of studies have shown a worrying lack of knowledge among healthcare workers about radiation safety issues and the radiation exposure levels connected to routine imaging procedures. Experts often underestimate the overall radiation doses associated with various imaging modalities. Furthermore, there are situations in which experts find it difficult to differentiate between imaging methods based on ionizing and nonionizing radiation (Partap et al., 2019). Furthermore, patients often don't fully comprehend the risks associated with radiation exposure. It is critical that people have a deeper understanding

of the dose and potential risks related to medical radiation. It is the responsibility of radiologists and referring physicians to efficiently and profitably deliver patients dosage information (Gutzeit et al., 2021).

- The last line of defense against radiation is provided by radiographers (Guide, 2018). Radiographers should have thorough training on acceptable doses for different medical exams, risk/benefit analyses, and the biological effects of radiation in order to accomplish this.

•Postgraduate students get training in radiation protection and safety, while undergraduate students must attend obligatory courses on radiation safety. It is also required of students to take classes that provide updates on new apparatus and technology that might lower radiation exposure without compromising image quality. •Be familiar with the software that makes it possible to monitor radiation exposure while engaging in daily activities.

•Take part in projects that compare and assess radiological procedures.

- Take part in multidisciplinary teams to set up and periodically evaluate diagnostic reference values for patients, both adult and pediatric.

If a radiographer lacks sufficient understanding, they might put the patient at greater danger by not optimizing the appropriate imaging settings. It is crucial to carefully evaluate the patient's age and the particular diagnostic issue while selecting the right tube voltage and current rotation time during CT imaging. Furthermore, it has been shown that using precise patient centering on the CT table and automated tube current management may effectively lower radiation exposure without sacrificing the quality of diagnostic pictures. Radiation dosage is significantly impacted by the localizer radiograph; however, the exact outcomes differ according on the CT scanner manufacturer (Paolicchi et al., 2020).

Radiologists and radiographers must be fully aware of these differences in order to guarantee that patients get the best examination possible in terms of a fair trade-off between radiation dose and image quality. Additionally, it is crucial to guarantee that patients undergoing several CT scans have less variation in their radiation exposure. Given the close correlation between radiation exposure and image noise, the iterative reconstruction approach may be used to data collected at lower doses while preserving clinical information (Mohammadinejad et al., 2021).

5.Enhancing patient safety via the efficient use of nursing personnel

Adverse events (AEs) are injuries that occur as a consequence of medical therapy, rather than being caused by the patient's underlying condition (Bates and Singh, 2018). AES affect from 2.9 to 16.6% of patients who are admitted to the hospital. Studies indicate that between 30 to 58% of these AES may have been prevented. Preventable AEs) are associated with significant morbidity and mortality, with 20 to 25% of all cases resulting in permanent disability or death (Stockwell et al., 2018).

Nurses are the predominant portion of the acute care hospital workforce, accounting for 30 to 40% of the hospital staff. According to Lasater et al. (2021), they make up 25% of the total

operating budget and 44% of the direct care expenses in acute care hospitals. Nurses have a vital role in averting AES by the regular monitoring of patient conditions, a practice that has been shown to enhance patient outcomes (Lasater et al., 2021).

Over the last twenty years, there have been several studies published that have investigated the connections between nurse staffing levels and AEs. Collectively, these research have furnished ecological data indicating that acute care hospitals with elevated nurse staffing levels exhibit reduced rates of mortality and adverse events (Aiken et al., 2018). In addition, it has been proposed that the use of extra hours and less skilled nursing personnel may result in adequate staffing levels, but these techniques are also linked to an increased likelihood of adverse events (Beltempo et al., 2016). Although these studies have made significant contributions to the area, the robustness of the findings they have presented has been called into question (Needleman et al., 2020).

Most of these studies used cross-sectional designs, in which the measurement of nurse staffing levels and the incidence of adverse events were conducted simultaneously (Mitchell et al., 2018). Due to the inability to define the temporal link between the exposure and the result in these research, it is challenging to establish whether the development of an adverse event can really be related to the previous exposure to low nurse staffing levels. Furthermore, the majority of these studies were conducted across many institutions and used extensive national, state, or provincial administrative databases to assess if there was a correlation between nurse staffing levels at the hospital level and adverse events, while taking into account the hospital's case mix (Cho et al., 2020). Although this method is valuable for benchmarking, it involves calculating the average staffing and AE statistics for extended durations, such as one year. Additionally, it encompasses all sorts of units, such as internal medicine and critical care units, as well as all patients inside a certain hospital. Consequently, it has been challenging to convert the findings of these research into precise guidelines about the ideal number of nurses needed for a particular patient at a certain moment during their hospital stay (Wang et al., 2020).

In order to advance this discipline, it is necessary to undertake longitudinal research at the level of patient analysis. These studies are necessary to not only establish the correlation between nurse staffing levels and AEs, but also to pinpoint the exact staffing patterns that pose the most risk, and discover the optimal staffing thresholds that limit the occurrence of AEs, taking into account the complexity of patient needs. It is crucial to address the fact that the health care business has been slower than other safety-sensitive industries, such aviation and long-distance transportation, in establishing personnel practices that reduce the likelihood Of AES (Cho et al., 2021). Recently, new techniques have been created to measure changes in nurse staffing levels over time, which is a first step in establishing policy in this area.

CONCLUSION

With the ongoing emphasis on patient safety efforts, the role of pharmacists will continue to develop as prescription errors remain a prominent concern. This will expand the possibilities for

pharmacists to become essential catalysts in the effort to decrease adverse occurrences and enhance healthcare safety.Clinicians have a crucial role in reducing errors that occur before laboratory analysis. Evidence has shown that training programs are an effective means of enhancing the quality of specimen collecting. Incorporating laboratory experts as key stakeholders in clinical rounds, patient safety committees, and training seminars facilitates the sharing of information to enhance patient safety. It is essential to establish a comprehensive and well-coordinated plan of action in order to enhance awareness of radiation hazards and to facilitate the dissemination of education and information about radiation safety. Ensuring patient safety is one of the primary duties of a nurse. The role of a nurse in ensuring patient safety is crucial and may be impacted by several circumstances, such as their work environment and the degree of support from their supervisors. Nurse leaders may cultivate a culture of patient safety and enhance clinical outcomes by effectively managing these issues.

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