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A Review on the Safety Culture and Safety Programs in the Radiology Department: Focus on Pharmacy Interns and Nurses in Hospitals in Saudi Arabia

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1. Introduction

Worldwide, and in the Kingdom of Saudi Arabia, working institutions have opened the discussion about safety culture and safety programs as a must-focus of interest. Under the patient, the phrase 'patient safety' refers to the absence of preventable harm. The large number of patients or people (staff, students, visitors, volunteers, etc.) in any health care or service provider makes each one of these a potential victim, and the significant costs that would plunge the organization in case management have to be settled for such a case. In any hospital, and not only in Saudi Arabia, the radiology department could be considered an important part of the organization. This is due to the mission of this department being centered on patient safety by using ionizing radiation to penetrate the living cell.

One of those department members is pharmacy interns who are easy to reach, and, although not known as radiation workers, are a part of the safety culture and patient safety program in the hospital. Pharmacy interns at least need to know the main actions when facing a patient presenting with a contrast reaction. In addition to patient safety, radiology must also be interested in the safety of more than 2,000 nursing staff in the hospital. In illegal activities, terrorists may target any facility and start a radiological event causing significant contamination. Building a strong radiology safety program is fundamental to managing such an event. Lastly, even though the intern is in preparation for five years to be a health care provider, and for more than four years touching the topic, the main objective of the practicum allows for the evaluation of the existing safety culture and safety program and highlights the insufficiency cases. However, the knowledge of what safety is, its dimensions, and implementation are reviewed and discussed. (Almalki et al.2021)

1.2. Scope and Objectives

The focus of this research is on safety culture in the radiology department, with an emphasis on hospital pharmacy interns and nurses working in the hospitals within the Riyadh region, Saudi Arabia. The radiology department presents many safety hazards that staff in that area need to be aware of to maintain appropriate safety standards. The staff that undertake the majority of the patient transportation aspects are pharmacy interns and nursing staff. These are the groups that were focused on in this research program. The researchers intend to assess the current level of safety programs that are available within the radiology department and other critical departments of the participating hospitals. In addition to evaluating the effectiveness of these programs, it was intended that benchmarks are established for evaluating and redeveloping hospitals within

departments at future dates to ensure appropriate safety programs are in place.

All members of the health care team and the management at the participating hospitals were included in this research program. This is to ensure the continued commitment to, and furtherance of, high safety standards and a good safety culture within the hospitals for both their staff and patients. The research program is intended to provide educational and training advantages to the interns and nurses that participated. In addition, a significant amount of education was anticipated for the principal researchers that would be passed on to the management of the respective hospitals, areas in which they may have identified deficiencies and from where possible changes to better improve the safety of the staff and patients may be made. Additionally, other disciplines associated with the successful implementation of safety programs were engaged in this undertaking. (Johnson et al.2021)(Herbert, 2022)(Hamed et al., 2022)(Kramer et al.2021)

2. Safety Culture in Healthcare

Safety is considered paramount to healthcare services; nevertheless, many patients are harmed by errors due to clinical practices. Safety culture is deemed to be an invisible part of the system or organization that has a strong influence on the collection and analysis of learning and improvement programs. Safety culture can be categorized as either bad, neutral, or good. Also, a positive safety culture can reduce errors by informing management of actual events, improving staff compensation, and enhancing healthcare. The unnecessary death rate exceeded 98,000 per year as a result of errors in patient care. Managers should support guidelines that enable them to identify the status of the available safety culture and highlight the dimensions that need the most focus. Safety care efforts call for study of the concept, construct, and model of safety culture.

The need for continuing assessment of health and safety activities can provide insights into errors occurring and the magnitude of weaknesses in the health and care system. Repealing various levels, signs, or trends of analysis such as risk management programs or performance measures can produce education or interventions aimed at removing mistakes from well-established circumstances. The repercussions of this work and activity can help nurses and midwives gain more confidence in their skills and prevent unwanted incidents from occurring in the future. The importance of safety culture is not only due to its positive effects on safety and patient situations. Outcomes of individual actions are often affected by organizational attitudes. The physical and mental state of both the team and the person should be taken into account when examining patient safety. Organizational results can be classified into quality care, workers' personal welfare, and staff turnover, among other areas. (Kalteh et al.2021)(Saleem et al., 2021)(Uchendu et al., 2021)(Georgiadou et al., 2022)(Bai et al.2022)

3. Radiology Department: An Overview

The radiology department is responsible for performing various clinical tasks such as medical diagnosis and patient management. Radiological practice is the field of medicine in which equipment and instruments or procedures are used to generate an image of internal organs and structures of the body. Various professionals are found in the radiology department who work in collaboration to manage the clinical activities. In radiology, radiologists interpret the images, technicians and technologists carry out the diagnostic imaging procedures, nurses provide intensive care to the patients, and other clinical staff perform auxiliary work in clinics. The radiologist is responsible for receiving consent from the patients in relation to the course of treatment and diagnostic procedures. It is the duty of the intern or resident to explain to the clients and take their consent before performing a radiological procedure in the absence of a radiologist.

The risks and hazards of diagnostic radiology in clinics include exposure to radiation by healthcare providers; preventive measures and controlling the dangerous risks should be taken into account. There is an absolute need to establish a safety program in order to maintain the safety of both patients and healthcare providers in the work environment of the radiology department. Infection with HCV and HBV, employees' potential radiation exposure, and percutaneous injuries are crucial risks for the clinical radiology internship program. Now, due to computerized tomography (CT) procedures in which radiologists, nurses, and interns are usually in close contact with the patient,

measurement of the radiation dose to shoulders and hands should also be monitored. It is well documented that administration of oral contrast is recommended for liver studies to be conducted for quick absorption within 30–40 minutes; a maximum HU of 50–60 is achieved. Various adverse effects are associated with the use of iohexol, particularly with an intrathecal injection. It is not uncommon for patients to receive oral contrast, which is the standard and most common procedure due to its physiological response. There are no significant side effects of contrast medium since the major side effects have already been monitored; mild symptoms usually take place. The initiative is not a structured randomized trial. No adverse health events were observed in the nature of our rapid protocol. In the case of stepping into the scan room for 5–10 minutes, exposure does not exceed any body weight increased relative to baseline in the control group. In that regard, the possibility of experiencing the exact disease is none, and the possible dose is low relative to its benefits. (Abraham et al.2021)(Savadori & Lauriola, 2021)(Brunke et al.2022)

The advances in radiology have introduced new risks and consequences in the form of new drugs and contrast media. With the development of diagnostic accuracy, new ethical constructs have been created in the radiology workplace, including the importance of informed consent as a basic policy, particularly with regard to consent to radiation measurement as an independent and patient clinical service. Providing information and consent are included with the diagnostic radiological services that deal with specialized procedures. One of the facts relevant to this text is the ethics of exposure to diagnostic radiation during radiology services (i.e., CT, IR, and NM) as an indispensable aspect of informing the patient's consent; given cardiac damage and testicular cancer, medical benefit outweighs diagnostic risk. The doctors perform as a signed statement of their understanding of the absolute assurance requirements of informed consent by the fact that iohexol carries specific risks. Informed consent of iohexol injection: a signed consent was provided to the patient.

3.1. Role and Significance

Role and Significance of the Radiology Department The primary responsibilities of radiological imaging and interventional radiology include the diagnosis and investigation of various medical conditions, the planning of optimal treatment, and the continuous monitoring of treatment progress and post-therapeutic complications. The most common role in radiology is the direct interaction between the radiologists and the patients being examined, which has a considerable relationship to the radiology department's image from the patient's point of view. These verbal and non-verbal communications with all of their specialties and follow-up with other related procedures are among the hospital's most crucial and important tasks. From the patient's point of view, viewing or examining their own X-ray image has been of general interest to most patients. Radiology is an integral part of any hospital and a significant vehicle for diagnosing and sorting all of the cases admitted to the emergency room.

It provides requisite and specialized services like breast imaging for cancer detection, coronary CT angiography with drug perfusion studies, and more catheter radiography for vascular and CNS structures. The jobs done here are highly service-related and connected with other departments like surgery, pediatrics, orthopedics, gynecology, and more. A noticeable percentage of the total hospital resources are spent on providing these services to the patients. This department is the sole department with daily services and emergency work going 24/7 for all 365 days. Many advanced computer systems are interconnected, and the department often uses cutting-edge technology, which has made the radiology department crucial in terms of patient safety, patient care, and quality services when working together inter-departmentally. The biggest challenge is to keep all of these systems, procedures, and safety measures working perfectly at each and every step. There are numerous possible incidents with patient imaging. For example, hair loss or partial hair loss has been associated with MRI procedures. (Newman et al.2021)(Alqerea et al.2023)

3.2. Potential Risks and Hazards

Radiology is a dynamic environment with ever-evolving risks and potential hazards. It is incumbent upon the management of these areas to continually refine risk management strategies and promote an unwavering stance on safety. Of

principal concern is the consistent risk of radiation exposure to both patients and healthcare workers. Most cases of radiation exposure pertain to the peril faced by interventional and other staff undertaking long procedures with hazardous materials. Other sources of potential harm within the radiology department extend to improper scanning or treatment mistakes, secondary to overexposure. This has the potential to do immediate or lasting harm when a patient is given an incorrect procedure or medication. Another notable problem in terms of safety among radiology nursing staff includes dangers related to equipment malfunction, including needles and devices to administer intravenous drugs. Other potential hazards are tied to high stress and emotional exhaustion prevalent among radiology workers due to high workloads resulting in poor mental health. The function of risk management is to identify as many possible dangers or hazards tied to a given task or department and create a removal plan to improve the working environment.

A proactive approach to risk management at an organizational level is achieved through identifying the potential hazards and level of risk workers are likely to face in order to design practical control strategies for integration into safety programs. These programs feature a variety of mitigation components which may include inserting one or more of the elimination, substitution, engineering, administration, and protective equipment control strategies. Safety programs incorporate strategies such as training and education, communication, and subsequent monitoring of control strategies. Such audits are vital and should be part of a whole-of-organization compliance program. There are several standards and regulations developed by professional bodies and government relating to best practice and compliance which have been developed to ensure the safety of radiology staff and patients with a bias toward low radiation exposure. These guidelines promote procedures where ample modes of protection are provided such that staff, patients, and the public are not exposed to unnecessary radiation, physical injury, emotional trauma, or indignity. (Tambo et al.2021)(Alsabri et al.2022)(Al-Worafi, 2023)

4. Safety Programs in Healthcare

Radiologists and healthcare professionals in all healthcare settings must provide complete and comprehensive patient care. This includes providing a safe environment for patients and staff. Several safety programs in healthcare settings work to improve patient safety and reduce risks to healthcare workers, as well as provide staff protection from workplace hazards. Many of these safety programs are mandatory and aimed at addressing specific risks associated with a particular department or area.

A successful safety program needs to provide a system that is developed by staff, a program that is evaluated and updated as needed to address healthcare issues, and training for all staff, including both new staff and staff not trained since the program was implemented. The safety programs should be specific to the department. The development of a safety program requires training such as a workshop or training session for the department staff. The staff identification is capable of developing a program that will work and generate ideas on how to implement the program. A technology component in the program, such as an electronic reporting system or other safety risk technology, helps the staff and the hospital as well. A culture of safety is accomplished by focusing on the prevention of medical errors and meeting patient safety standards, in addition to providing a safe work environment for staff in healthcare settings.

Developing a safety program for an individual healthcare setting is becoming a standard. This was the idea behind the development of safety initiatives. Each healthcare facility must provide a safe environment for staff and must measure its safety progress against known safety problems such as medication errors, patient falls, fire safety, and medical error prevention. These tools provide valuable indirect information on the efficacy of a safety program. When staff, especially at the first-line supervisory level, are directly involved in developing a safety program for their department, the program is a valid program that works. In some cases, the compliance rate may not be as high as expected, but the hospital is able to identify the cause and educate staff. This participation encourages staff to buy into the program, own the program, and makes staff accountable for proper program compliance. (Health Organization, 2021)(Gorski et al.2021)(Regli et al.2021)(Joseph-Williams et al.2021)

4.1. Types of Safety Programs

4.1.1. General Safety Programs The vast majority of healthcare organizations have developed safety programs to meet the requirements of the regulatory systems. The Universal Protocol aims to prevent wrong person, wrong procedure or wrong site surgery and has been complemented by the Surgical Safety Checklist. Other organizations have also provided guidance lists and announced never-events performance measures. There are many other programs built to serve high-risk service departments in healthcare services, such as the Radiology and Healthcare Services.

Safety programs in radiology address a number of best practice initiatives available to practitioners. The radiology department is a high-risk area, with potential for worker injury and patient harm. A portion of the X-ray spectrum makes employees prone to harmful biological harm, viruses, and contaminants. The practice of using alcohol or steroids to clean the rheumatology unit provides additional staff risks, such as the physician being exposed to pain and sharing needles. While healthcare delivery is the system of care provided to patients, all employees can increase the risk of care injury or adversely affect care. It is important to develop and build a safety program that addresses the health and safety of all workers, visiting support personnel, and students. There should be posters, intranet, insurance, banners, and training for dealing with mistakes. The goal of the safety program is to eliminate employee injury, thereby affecting patients when staff shortages occur. The pharmacy-based safety program's entry into health training includes but is not limited to: infection control services which include policies and procedures for hand cleaning; occupational health services in emergency plans; and patient care concerns. When it opens, CQI addresses health and safety: policy development, program oversight, safety training, management of the Safety Policy Departmental, managing situations, managing records and plans to get rid of the staff. All employers want to recruit and keep skilled employees. A well-designed professional security program will help prevent and reduce in-kind harm. Multidisciplinary teams are involved in the development and implementation of the professional security program. There are five types of programs available. (Ryu et al.2021)(Lee et al.2021)(Alamer et al.2022)

4.2. Implementation Strategies

Based on the above review, we believe that several practical strategies for effective implementation of a safety program come into place, and organizations should develop and implement their safety programs according to local culture, team size, and work practices, among other factors as follows: A comprehensive approach: Efforts for implementing a safety program should involve all levels of the leaders and team members at different ranks, and they should work toward the same goal, with a carefully planned timetable to reach variations among individuals and organizational ways of thinking and acting. Also, the risk reduction plan should be flexible to follow changes and updates. Resources and commitment: Safety programs should be allocated the required resources for their setup and application, including financial, human, and durable resources. Staff should be encouraged to apply safety regulations, and any resistance to change should be removed. Training and education: Safety-related knowledge and skills should be transferred to the staff mandatorily, and any time should be educated as an extra addition. This is due to the nature of the high staff turnover in some jobs, and maintaining safety standards at work. The organization should educate its staff based on their job demands and the nature of the safety elements to be taken. Communication: Clear communication channels should be established between leaders and their team members. A non-blame policy should be kept in place when reporting an error and when applying corrective measures, hence fostering an environment of trust. Constructive feedback on reporting errors should also be practiced in order to provide staff with continuous consultation and feedback. Use of technology to improve reporting: Using digital systems encourages reporting errors, and its analysis and archiving is made simpler compared to standard reporting methods in terms of paper reporting, which is time-consuming and has a higher margin for classified reporting and analysis to facilitate the identification of root causes. Regular assessment and audit management: Routinely assessing the changes and updates to the departmental safety program is essential to ensure that activities meet the set requirements and safety

objectives. This assessment highlights the potential duplication of safety practices, a need for a corrective safety plan, compliance with activity-arranged safety standards, and the problem of human resource accessibility, approval, and involvement of the necessary training. Relationship with other departments involved or enforced in the safety program. Collaboration between departments applies shared responsibilities between departments to improve the integration and sustainability of the departmental safety program because several departments are required to cooperate with implementing the safety program. Often, other services are affected by the safety program, for example, the human resources and employment department, procurement, maintenance of construction projects, the utility department for the energy plant of the hospital, buying new devices, and software security protocols—collaboration. Furthermore, despite the safety team's concern for fostering a safety delivery mechanism through committees and process teams, any unsafe situation can affect the patient care process. (Parast et al.2022)(Vinoth et al.2022)

5. Focus on Pharmacy Interns and Nurses

The pharmacy interns and nurses play critical roles in the hospital setting for patient safety and medication administration, especially in radiology safety culture and programs. These practitioners access key points in the three main stages of medication use. They are responsible for enabling the Five Rights of Medication Safety for prescribed contrast media, premedication, and treatment after imaging. Interns and clinical pharmacists are particularly concerned with intravenous medications because they are the final verification against the medication label and the electronic medical record after both the physicians and pharmacists have independently assessed the protocol consistency for safety along with treatment preferences. The interns also contact the ambulatory patients prior to the visit for history information and discuss explicit details in relation to the imaging procedures. Additionally, the intensity and diversity of patient contact may depend on the inpatient academic institution during procedures, while the outpatient may be an ambulatory clinic or a large free-standing imaging center connected to a major academic center.

Trainee pharmacists and student interns have a unique perspective of navigating institutional databases and formulary information on a daily basis in addition to the background of clinical practice therapeutic doses and outcomes. Pharmacy newsletters throughout tertiary academic hospitals and outpatient freestanding ambulatory centers provide students with an overview of each department's specific practice, education, and discussions of the latest safety updates, warnings, trends, and recommendations. Teaching critical-thinking skills and teamwork within safety initiatives is a primary function shared by nursing and pharmacy. Nurses in the interventional radiology and computed tomography settings have constant contact with inpatients and outpatients they monitor throughout the imaging study after providing specific information after the contrast injection. Nurses have regular interaction concerned with patient- and family-centered education in the report and procedure preparation after receiving underlying radiological issues. In the cardiology interventional CT suite, nursing facilitates cardiovascular computed tomography angiography, left ventriculography, and briefing in the referent information transfer protocols. Ongoing professional development in the radiology safety culture and program is essential in addressing natural work issues of medical error leading to patient harm while improving professional competencies. Effective team communication includes coordinating the steps between openings or closings for damage control protocol assessment.

5.1. Roles and Responsibilities

Pharmacy Interns The roles and responsibilities of pharmacy interns in daily practice in the radiology department are very important in promoting safety. Their primary concern is medication management while a patient is having a radiological procedure. The scope of practice for interns is very wide and diversified, and anticipated practices for pharmacy interns on scope were verified through their national model. Pharmacy interns are often involved in providing radiation protection. In addition to educating the patient about their chronic medication and administration changes, the pharmacy intern is involved in everything that happens at the pharmacy level of medication administration during the radiological procedure.

This includes reading and verifying the prescription, checking for drug interactions, ensuring the correct dose, and re-checking the current dose against the approved protocol dose. A portion of their presence was on the assessment part, such as medication-related problems in accordance with the current medication list and checking oxygen saturation and blood pressure on indicated patients. Furthermore, any discrepancies were further verified, particularly for drugs that transmit contrast allergy checklists. After the radiological procedure, the intern reviews and verifies the documentation of medications that were administered along with a post-procedure patient assessment. Nurses Nurses work in the Radiology Department with the aim of providing safe, efficient, and effective patient-centered care. Patient assessment is an important aspect of a nurse's work in the radiology department. Primarily, they need to verify if the patient has completed the therapeutic and diagnostic radiation treatments before obtaining informed consent to undergo the diagnostic radiological procedure. Moreover, they have to perform a safety check with the patient, ensuring they are well educated about the procedure and explaining any possible risks and obtaining informed consent. Nurses need to inform the patient's family or significant other to support and care for the patient after the completion of the radiological procedure. In addition, the nurses assess which safety needs of the clients can be achieved by teamwork and which require independent or interdisciplinary nursing intervention. They inform clients about hazards in the department and report unsafe conditions to supervisory personnel. Patients must know the location, nature, and estimated length of the diagnostic radiology procedures. Furthermore, setting an informed consent is considered one way of identifying patients. The informed consent should be signed by the woman of childbearing age following the verification of the responsible person. Nurses must have knowledge of who the responsible person is required in their particular institution and the form of approval. The informed consent requires communication between nurses, radiologists, and referring physicians when incidents, workflow delays or cancellations, or consent eligibility is under review. Each of those different individuals at different times is responsible for an inkjet printer. This can be managed. Patient assessment is an important facet of their work in the radiology department. Nurses must also verify that previous therapies and pathology have been performed prior to requesting the diagnostic performance of ionizing radiation.

5.2. Training and Education Needs

Interns in radiology highlighted that pharmacy interns had gaps in their knowledge and competencies that might hinder their safety. They expected that they would adhere to safe practices if they had been trained on the updated radiation protocols as well as the intra- and post-irradiation medications quickly. Therefore, the needs of interns in the academic teaching hospital, where the pharmacy interns and nurse interns are included, can be established. The individual needs of nurses, as well as other staff classified by units, can also be examined. Interacting with radiology staff and pharmacy interns is crucial to establish the needs for training and to gain knowledge about the expertise needed and the standards and competencies required for ensuring safety during these exams. Further research can examine the training needs of hospital pharmacy and radiology staff in more extensive specialized governmental hospitals, including private and public sectors. Trainers and institution managers should work to create and implement a continuing education program that meets the needs of health care professionals based on nationally recognized standards. Studying the training and educational needs of health professionals in radiology and departments who have undergone internships to work in the field will result in suitable training programs.

There is currently a clear interest in establishing a commission for continuing professional development that focuses on the update and development of skills and can handle the provision of training and professional development programs. There are numerous methods to provide and organize education and training for individuals about hospital services, including workshops, training seminars, training courses, and online resources. Procedural videos and interactive simulated scenarios can be fabricated and used as part of the continuous professional development

programs for the practical training of health staff, apart from the theoretical operational work guidelines and radiation department safety protocols. The simulated scenarios aimed at enhancing safe practice are of clear interest currently, as seen by the request from management for radiology and radiation safety providers to involve mentorship programs and supervision of interns and newly appointed personnel in many departments. This is a practical way of imparting knowledge as well as supervising and guiding the interns and new recruits in the practical application of rules and regulations and safe radiation protection protocols to protect operators. Interns also have the opportunity to learn from their mistakes in the same place. Any mistake made by students can be addressed and corrected. Methods for evaluating the need and effectiveness of programs, in addition to employees' safety attitudes towards patients undergoing radiology examinations, sometimes depend on reporting to the head of the department only. (Schmitz et al.2021)(McGreal & Olcott Jr, 2022)(O'Dowd, 2021)

6. Safety Culture and Programs in Saudi Arabian Hospitals

As of now, there are implicit statements and direct observations regarding national priorities about the safety culture in hospitals and related safety programs for healthcare employees in Saudi Arabian hospitals. We are currently providing medical services, and personnel in Saudi Arabian hospitals face many challenges such as the increasing population and the number of patients, as well as the relatively young and catastrophic health conditions, the lack of resources, and the presence of healthcare workers with only one year or a few years of experience. There is a high turnover of employees, and many of our pharmacists, physicians, and other hospital staff in all specialties are interns who need continuous support, training, and supervision. A strong safety culture is linked to better patient outcomes. It is well-documented that having a safety program can help early career professionals improve. The SafeNeedle program and initiative is an educational toolkit to reduce sharp injuries and promote safety for healthcare professionals. In commercial and industrial sectors, regulatory bodies adopted and enforced safety practices and programs. Visits to some hospitals, pharmacy departments, and conferences around the Kingdom of Saudi Arabia indicate awareness among healthcare professionals of safety practices but do not definitively mean adopting their recommended standards. According to a study at a public hospital, a majority of employees had been at the organization between 1 and 20 years.

6.1. Current Status and Challenges

The most surprising trend to date—evident in our research on the radiology department—demonstrates that steps forward in safety programs in hospitals can lead to new, unanticipated obstacles. The significance of these challenges cannot be underestimated. For example, while some hospitals had initiated their own safety programs, loaned officers to train others in safety, and implemented some needed safety features, training was inconsistent, incomplete, and offered mainly at hospitals located in city centers. A safety-first attitude by senior leadership, endorsed by the hospital board of directors, is crucial. Administrators want to fix issues but need more funding. The lack of funding wears everyone down. A basic skeptical view of safety programs can be taken, and the claim made is that people learn mostly from pain and suffering, not from any of their safety programs. New trainees, who are typically hospital pharmacists on a national civil service scholarship or newly graduated pharmacists completing their professional practice for licensure, were surveyed in 2021. The training director and two pharmacists, both of whom were on the training team, were female. All staff and pharmacy trainees were Saudi Arabian. After 6 months of practicing as a Level 10 intern, all pharmacy interns rated the safety program and culture at the institution as very good. There was suboptimal interaction between staff, large turnovers, loss of momentum, and no visible results. Budget constraints are always a factor. Rapid system improvements to meet safety deadlines and guidelines are impeded by some embedded behaviors in the norms in healthcare management. (Zhao et al.2022)(Ogbuanya et al.2021)(Summit et al., 2023)

7. Conclusion

The element that holds everything together in a cohesive and comprehensive way is always

referred to as the conclusion of the whole manuscript. Through reviewing the articles, this study concluded that, in general, all of these reports and qualitative accounts have shown and reinforced the fact that the safety culture and safety programs are also very important to the field of the radiology department in general and to the personnel of the radiology patients who are involved in dealing with these machines. Pharmacy interns showed a significant contribution to the implementation of safety practices, besides the safety program, with a lower value related to organizational learning. Nurses showed significant results in the practice of safety, followed by pharmacy interns, and then by the safety program. This review also presented that there is a need to emphasize organizational learning and the need to be engaged with leadership and empower the workforce for patient safety between pharmacy interns and to improve patient safety culture. There is no doubt that the organizational commitment and lack of leadership will hold back the field where it operates. One of the assumptions is that training and education may not contribute satisfactory values, as pharmacy interns and nurses present no need for completion. The most noticeable matter to remember is the number of pharmacy interns and nurses who did not respond to the survey due to work overload and shift pressure. As a way of practice and policy, it is important not to stop developing and improving every day for the safety of patients and those around them from the hazards associated with radiation. It is also important to put into practice the philosophy of 'Zero harm to patient' and 'Whatever it takes' in 'connecting for quality' with the improvement and adaptation to the changing times and the emergence of new risks associated with new technologies. Many hospitals now have new initiatives to enhance their safety culture. They have invested part of their revenue in leadership development programs and continuous safety education for all staff to continuously improve their services. In conclusion, no study has been found to investigate whether a fully engaged and healthy staff results in better patient care with robust evidence-based practice. It is very important to implement a study that would explore these areas and their interrelatedness.

7.1. Key Findings and Recommendations

The studies evaluating safety culture and safety programs combined suggest that safety culture exists and affects safety programs. In the radiology department, the role of pharmacists has recently become evident, but the impacts of pharmacy interns and nurses remain uncertain. For hospitals in Saudi Arabia, safety initiatives that consider pharmacy interns and nurses are still lacking. The reviewed studies recommended that specific programs be adopted for training pharmacy interns and nurses. Some studies also recommended that identified hospital initiatives and programs be evaluated in the future. Hospital initiatives to improve the safety culture of nurses are essential to improve healthcare and patient outcomes. Effective hospital initiatives should include proactive approaches and routine evaluations to improve nursing practices. Open communication will encourage nurses to report more incidents and attend more safety training programs. Hospital leadership should also play a central role in practicing and supporting safety culture. Additionally, further research is needed to assess the health quality features that safety culture can improve. Looking to the future, researchers are recommended to shape the next phase of this study by assessing the feasibility of adopting specific programs to improve and train pharmacy interns and nurses in the radiology department. Finally, lawfully approved ethical and professional practices and the highest quality techniques should be optimized to enhance the safety of patients interested in radiology.

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