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THE ROLE OF RADIOLOGY NURSES IN MODERN HEALTHCARE

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Abstract
In the current healthcare system, radiology nurses play a crucial role in bridging the gap between patient-centered treatment and technology improvements. With an emphasis on patient advocacy, radiation safety, technological proficiency, and privacy, this study examines the ethical issues that arise in the practice of radiology nursing. Radiology nurses protect patient information by adhering to stringent privacy and confidentiality rules, and they also help healthcare providers communicate effectively. Radiology nurses put the safety of their patients first while dealing with ionizing radiation exposure, which includes advocating for dose optimization and following safety procedures. In order to manage the quickly changing technologies with professionalism, technological competence and integrity are critical qualities that call for ongoing education and ethical thought. The core of radiology nursing practice is patient advocacy, which supports patient empowerment, comfort, safety, continuity of care, and informed consent throughout the imaging process. In providing patient care, radiology nurses uphold the highest standards of professionalism, ethics, and compassion by adhering to these ethical imperatives.

Aim: To detect the role of nurses in radiology and the prevention measures.

Key words: Radiology, Nurses, Medical radiology, Safety.

Introduction

Radiology is a fast-expanding field as a result of technological and imaging advancements. With the use of radiologic procedures, percutaneous minimally invasive approaches are reducing hospital stays, pain, and recovery times for patients while also increasing outcomes. Expensive surgical methods like exploratory laparotomies have mostly been replaced with image-guided biopsies, and patients with liver cancer who are not candidates for surgery can still receive therapy with radiofrequency ablations. The need for radiology nurses with the expertise, abilities, and attitudes that promote and support the best possible patient outcomes is growing along with the field of radiology. Nursing students hardly ever get the chance to do a clinical rotation in radiology, and nurses outside of the discipline are rarely exposed to this field. Because of this, radiology nursing is still a relatively unknown specialty and an unlikely career path (Muriel Moyo, 2019).

One significant risk factor is ionizing radiation. However, there are numerous advantages to employing ionizing radiation in medicine, particularly when it comes to illness prevention, diagnosis, and treatment. Some diagnostic techniques rely on an imaging approach that generates ionizing radiation. Conversely, radioactive contrast dye that is administered to the patient during the examination is visualized using alternative diagnostic techniques. The development of radiology has made it simpler to diagnose numerous illnesses that contribute to a population's morbidity and death. Additionally, a lot of treatment approaches—like radiotherapy for cancer—are dependent on ionizing radiation procedures (Bárdyová et al., 2021).

To prolong a patient's life by reducing the mortality and morbidity of specific diseases is the goal of both public health and all radiological procedures. Many of the goals of radiation protection and public health are similar. The primary goal is to minimize the harmful biological consequences of ionizing radiation during medical tests with a focus on the patient (Bárdyová et al., 2021).

In a range of healthcare environments, including community hospitals, academic medical institutions, outpatient imaging facilities, and freestanding radiology clinics, radiology nurses have an impact on patient care. In the dynamic field of radiology, nurses can work in a variety of modalities and subspecialties, including computed tomography (CT), ultrasound, neuro-interventional radiology, magnetic resonance imaging (MRI), and radiology-oncology. Many nurses take pleasure in the autonomy and range of care duties they have while contributing significantly to a small group of highly qualified healthcare professionals. Radiology nurses provide treatment to patients of all ages and acuity levels and possess a wide range of skills. They might give an MRI patient a glucagon injection in one visit, handle an emergency contrast media reaction in the next, and then do a high-risk interventional surgery on a patient who is bleeding heavily by transfusing blood. Successful nurses in this setting are adaptable and at ease with a shifting schedule (Muriel Moyo, 2019).

Literature review

Patients in hospitals can often be referred to the Radiology Department (RD) for diagnosis and treatment. RDs are frequently visited by a large number of patients and have developed from simple x-ray machines to multiroom facilities with a variety of imaging modalities, such as magnetic resonance imaging (MRI), computerized tomography (CT), interventional radiology (IR), ultrasound (US), and others (Ilyas et al., 2019).

Nurse practitioners (NPs) are essential to health care organizations because they operate as a bridge between various specialties, including medical imaging (MI), allowing for patient care management that aims to provide consistent, high-quality care. In healthcare, accessibility, appropriateness, affordability, availability, efficacy, efficiency, and safety are all implicit components of the quality principle. Furthermore, the idea of welfare and continuity of care that transcends the hospital complex is crucial. Three distinct domains—relational, management, and informational continuity—are included in the multidimensional idea of continuity, with a focus on how these domains interact with

one another. Continuity of care (CoC) is a crucial component of effectiveness, safety, and quality. CoC denotes the timely, logical, and cogent delivery of services. These nurses play a crucial role in providing continuity and all-encompassing care during the planning, execution, assessment, diagnosis, and evaluation phases of the nursing process. Providing nursing care to people's families, communities, or populations while applying professional competence, skill, critical thinking, and knowledge based on evidence (Rekha Makanjee, 2023).

Medical specializations, patient care, and multidimensional healthcare delivery are all impacted by and share access to medical imaging (MI) technologies. Their services are essential for the management of a variety of diseases that contribute to continuity of care (CoC), such as primary prevention, prompt detection and diagnosis, treatment, and post-therapy rehabilitation or palliative care. They are also essential for image-guided diagnostic tumor sampling for pathology work-up and therapeutic interventions, as well as fluoroscopic real-time visualization of various types of pathology. It is consistent with the latest research project about medical imaging's function in value-based healthcare. A timely diagnosis is one that is heavily dependent on the imaging technology's usability, efficacy, and efficiency (Frija et al., 2021).

It includes imaging methods that are both ionizing and non-ionizing. Non-ionizing imaging modalities include diagnostic ultrasound and magnetic resonance imaging, while ionizing imaging modalities include general radiography, fluoroscopic imaging examinations, mobile and portable radiography, mammography, computed tomography, angiographic and interventional angiographic imaging examinations, and diagnostic nuclear medicine. To identify, track, or treat medical disorders, many examination kinds, their corresponding imaging modalities, and the interpretation of the imaging series are utilized (Hricak et al., 2021).

From the standpoint of medical imaging (MI) quality management, MI service refers to an appreciation of the significance of quality as a determinant of competitiveness, including greater competition, globalization, technical advancement, and shifts in the patient profile in these services. By implementing evidence-based practice initiatives and assessment abilities, nursing impacts and provides value to radiology and imaging diagnosis practice. Additionally, nurses' specialization in MI is acknowledged. Since the responsibilities of NPs and other members of the health team are changing, it is important to pay attention to the dissemination of this specialty, the production of knowledge, and the nursing accreditation process in this area (Brady et al., 2020).

Role of nurse practitioners (NPs) in caring for patients in medical imaging (MI)

Medical imaging (MI) nurse practitioners (NPs) began providing patient care in the 1970s due to multimodality and advanced imaging technologies. Consequently, there's a chance to boost productivity, expand service offerings, and raise MI departments' profile. Transitioning from consistent nursing care plans and routines to the frequent plan changes that occur when a patient switches modalities could present a problem in the immediate MI working environment. Working closely with interdisciplinary teams in imaging services, making sure that rules, regulations, and procedures are followed and support meaningful advancements (Schlunegger et al., 2021).

Figure 1. Radiology nurses are systems thinkers who manage environmental and system resources for effective care (Muriel Moyo, 2019).

For instance, depending on the patient's characteristics, the general or plain radiographic examination, the radiographer's skill and the equipment's ability to ensure the patient's comfort in the MI examination room, the patient's orientation and support of their immobility during the exam, and the patient's cooperation in holding their breath for a period of time are all dependent on each other. Ensuring that the patient is in a tranquil and comfortable atmosphere is crucial. When patients need sedation, especially those in the pediatric population, complications might occur. frequently need scheduling in accordance with the medical specialist and specialized nursing care center of the hospital. There were disparities in the kinds of medications and how they were administered, according to Ruess and the writers. An additional complicating element was the varying degrees of experience (Rekha Makanjee, 2023).

A multidisciplinary committee with representatives from the nursing staff, pediatric radiology, anesthesia, and quality services physicians was organized to address this problem. The review involved standardizing the ordering procedure, pre-sedation history and physical examination, physician training and staffing, and sedation drug protocols by following institutional and national regulatory bodies' recommendations and protocols. The safety, efficacy, and efficiency of sedative medicine for standard diagnostic imaging procedures were improved by implementing a sedation pathway (Rekha Makanjee, 2023).

To guarantee training and education requirements, clinical nurse educators work in conjunction with the radiology CNS, radiology nurse manager, and pertinent providers. In addition to being involved in the planning and execution of orientation relevant to the unit and the validation of radiology nurses' skills, they assist radiology nurses in obtaining initial and continuing competencies. These instructors also create guidelines for newly purchased tools and processes. Charge nurses typically handle both administrative and direct patient care. They organize the department's daily patient flow and

throughput. For example, they make use of environmental services personnel to guarantee prompt room turnover, relieve staff nurses during meal and break times, and encourage effective resource use (Muriel Moyo, 2019).

Charge nurses are crucial to the department's succession planning and staff leadership development. The accomplishment of organizational goals and the performance and engagement of frontline staff are driven by nurse managers. They must possess excellent interpersonal and communication skills in addition to being critical thinkers. Nurse managers make ensuring there is enough staffing, assess employee performance, promote safety and quality, and guarantee that the care provided is within guidelines and norms. In addition to being coaches, mentors, and motivators for their workers, nurse managers create a positive work atmosphere (Muriel Moyo, 2019).

Role of nurses outside the immediate medical imaging (MI) environment

When it comes to managing patients for both ionizing and non-ionizing MI exams, nurses play a crucial role. Non-medical imaging NPs' role in handovers and the significance of an efficient communication and information exchange method were briefly discussed in the preceding section. The competency, roles, and responsibilities of modern multidisciplinary team members are essential in ensuring that crucial decision-making processes and procedures regarding MI examination protocols are aligned, coordinated, cooperative, collaborative, and communicated in order to maintain and sustain the seamless clinical medical CoC and the people's wellbeing. For instance, it has been demonstrated that NPs can insert central catheters peripherally under fluoroscopy guidance, which is a safe and appropriate substitute for radiologist insertion with comparable technical success and long-term complication rates. It might have knock-on benefits in the shape of lower costs, technical ward support, and more time for radiology medical staff to do additional fluoroscopic or angiographic treatments (Askey & Clements, 2019).

Roles of nurses in Interventional Radiology Center

In order to meet the needs of different wards and provide positive social and economic effects, the centralized management method integrates medical resources, including a variety of medical supplies and equipment. Technologists, other staff members, and Interventional Radiology Nurses (IRNs) could work at interventional radiology centers more productively. The interventional radiology center's centralized management approach has improved the treatment effect of joint medical imaging technology, normalized nursing quality management, standardized the development of interventional radiology nursing, and optimized the deployment of human resources and equipment efficiency. It has also rationalized the management of interventional therapy materials and the interventional therapy schedule arrangement (Chen et al., 2020).

The Interventional Radiology Nurses (IRNs) in an interventional radiology center performed the following duties, acting as sort of housekeepers. Adequately plan the interventional therapy regimen and give emergency preparations first priority. optimizing the efficiency of the interventional radiology equipment through improved use and management. making timely contact with engineers to maintain and repair machinery. Keeping track of sterile and valuable supplies, and rotating high-value supplies at the right rate to reduce the chance of them running out or expiring. delivering consistent, excellent interventional perioperative nursing across many wards, professionally collaborating with peripheral vascular, neurovascular, cardiovascular, and tumor interventional therapy. The interventional radiology center would grow to become one of the most significant venues for interventional radiology nursing disciplines, much like the surgical OR centers. IRNs should take on management responsibilities, develop professionally, and help create a platform for effective and high-quality interventional radiology treatment (Chen et al., 2020).

Nursing role mobile radiography

In mobile radiography, nurses are essential because they tend to patients prior to, during, and following the diagnostic imaging test. In the UK and the Republic of Ireland, advanced nurse

practitioners and nurse consultants are now able to evaluate and recommend patients for certain radiological procedures as part of their enlarged scope of practice. Understanding imaging exams is necessary for this. Imaging patients outside of the radiology department with portable X-ray equipment is known as mobile radiography. Because of the early compact portable X-ray devices that were intended to be disassembled and reassembled at the patient's location or bedside, these imaging tests are frequently referred to as "portable X-rays." Sadly, the low power output, excessive radiation dosages to the patients, and subpar image quality of these portable X-ray machines were all problems. These factors have led to the discontinuation of portable X-ray devices in medical practice. Nonetheless, the phrase "portable X-ray" has endured among medical practitioners and is frequently employed in relation to mobile radiography (Bwanga, 2020).

When the X-ray is expected to be available on the PACS system or in hard copies, the nurse or referring physician should be notified at the conclusion of the imaging examination. Emphasis should be placed on the necessity of submitting a written request for an X-ray prior to the imaging examination. This is because the radiographer will require the electronic request to process the CR plate for the analogue imaging system and to carry out the exposure for digital radiography. Occasionally, due to a lack of knowledge of the procedure, physicians request an imaging examination before submitting a written request (Bwanga, 2020).

Stress in Radiology Nursing

The nursing profession is still challenging and difficult. The demands and anxieties that arise in the radiology department do not exclude radiology nurses. A brief history of stress is looked at from the writings of early theorists, including Walter Cannon, Hans Selye, and Richard Lazarus, in order to better comprehend the notion. We talk about the physiology of stress and its accompanying indications and symptoms, specifically focusing on how it affects modern radiology nurses. Discussion is held regarding the causes and effects of untreated chronic stress that leads to burnout. Lastly, methods employed with interventions by different professions are discussed. Radiology nurses can be used in a changing healthcare environment to improve coping mechanisms and stress management (Laukhuf & Laukhuf, 2016).

Safety and prevention

Medical imaging (MI) specialists should be informed of any infection control measures, and infection control procedures should always be followed. Include the radiation safety protection clothing and the MI equipment together with its accessories. For example, it is best to have specialized units on hand for theatrical and mobile MI equipment as well as their accessories. To stop bodily fluids from contaminating the image receptor during an imaging test, it is advisable to cover it with an appropriate cover material (double-bagged if necessary). Additionally, remember that the substance is radiolucent and won't produce an artifact. This could jeopardize the patient's safety and degrade the quality of the MI assessment. It is recommended to wear adequate personal protection equipment (PPE) when handling highly contagious illnesses. PPE and other contaminated equipment should be disposed of in the appropriate garbage bins. NP might occasionally be needed to help with these patients' imaging. It is essential to understand the concepts of barrier nursing practices for infection control (Rekha Makanjee, 2023).

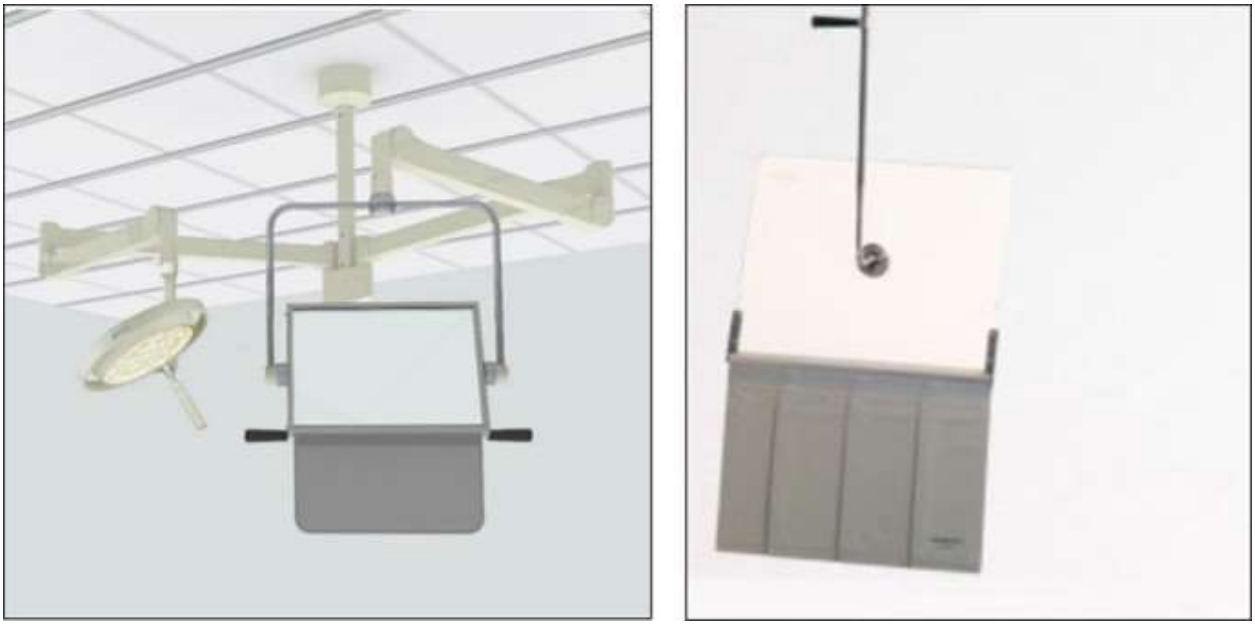

Figure 2. Different ceiling-suspended eye shields (Cornacchia et al., 2019).

It's critical to protect patients from occupational radiation exposure in clinical settings. The current state of medical occupational exposure protection is explained in this study, along with potential future safety measures. It is imperative that medical professionals who perform interventional radiology (IVR) employ shielding gear, such as lead glasses and ceiling-suspended shields, as reports of radiation-related illnesses, including cataracts, have been made. As of right now, multiple radiation shield combinations are needed because there isn't one ideal radiation shield. The proper education of radiological medical personnel is necessary to minimize radiation exposure to patients and staff. They also need to know about the several approaches that can be used to estimate or lower occupational exposure and patient dose (Chida, 2022).

Without sacrificing the ability to diagnose patients, radiological medical personnel's exposure drops when patient dose optimization techniques, such as removing unnecessary doses, are used. Consequently, lowering the patient dosage also lowers exposure at work. In order to shield medical personnel from radiation, researchers have developed a revolutionary four-point policy: patient dosage optimization, distance, shielding, and time. By ensuring that the patient never takes more medication than is required, patient dose optimization also lowers the dosage that staff members receive. Shielding is important, but it is only one part of the radiation protection employed in medical procedures; the patient dose needs to be optimized. Here, we go over the fundamentals of radiation protection and reduction for radiological medical professionals, with an emphasis on IVR staff (Chida, 2022).

By using safety glasses with lead-glass lenses that are tailored to the shape of the face, one can lessen their exposure to eye lenses. Lead eyewear that protects against side exposures can reduce dosages by 2.5–4.5 times. A ceiling-suspended eye cover is an additional tool for lowering occupational dose during interventional procedures. To reduce dispersed radiation, it should be positioned as close to the patient as feasible and closer to the image detector; for ceiling-suspended shields, a dose reduction factor (DRF) of 5 is usually utilized (Cornacchia et al., 2019).

Conclusion

The techniques for radiobiological imaging provide insightful data for treatment and diagnosis. However, exposure to ionizing radiation can increase the amount of health risks for both patients and medical personnel if they are used irrationally or if the safety precautions built into the principles of

radiation protection are disregarded. The radiology department, which uses stationary, powerful X-ray equipment to produce high-quality images, should be the location of most radiological examinations. The X-ray tube's radiation is likewise intended to be contained within the department. It should be emphasized that health practitioners performing radiological examinations must possess sufficient information on mobile radiography. To keep health professionals up to date on information and abilities, this should be learned throughout undergraduate training and reinforced via continuing professional development (CPD) learning activities. It is important to stress that one of the fundamental tenets of good medical practice is the safe and appropriate use of ionizing radiation in medicine. In order to prevent the undesirable biological effects of radiation on human tissue, epidemiology research, ongoing medical staff education, and knowledge of the mechanisms underlying these effects on human cells are all essential.

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