SILENT ERROR IN RADIOLOGY MISTAKE WE DONT SEE BUT THE PATIENTS SUFFERS

[1]Kunal, [2]Diksha, [3]Shweta Rani, [4]Albin Binoy, [5]Ronit Verma
[1]Student, [2]Student, [3]Student, [4] Student, [5]Student
[1]Department of Radio Imaging Technology, [2]Department of Radio Imaging Technology, [3]Department of Radio Imaging Technology,
[4]Department of Radio Imaging Technology, [5]Department of Radio Imaging Technology
[1,2,3,4,5]Jagannath University, Bahadurgarh, Haryana, India
[1]kunaljangra110@gmail.com, [2]dushikhathakur@gmail.com
, [3]ranirekha2106@gmail.com ,
[4]albinbinoy39@gmail.com, [5]ronitverma9311@gmail.com

Abstract— **Radiology is an essential branch of modern medicine that uses various imaging techniques to diagnose, monitor, and guide the treatment of diseases without invasive procedures. Common imaging modalities include X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound, Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT), and Dual-Energy X-ray Absorptiometry (DEXA). Each technique operates on different physical principles and has specific clinical applications in medical diagnosis. Some modalities, such as X-ray, CT, PET, SPECT, and DEXA, use ionizing radiation, while MRI and ultrasound use non-ionizing radiation and are considered comparatively safer. Although radiological techniques provide significant benefits in healthcare, exposure to radiation can produce harmful effects on the human body and environment, including deterministic and stochastic effects such as tissue damage, cancer risk, genetic mutations, and environmental contamination. In addition, silent errors in radiology, including misdiagnosis, technical mistakes, communication failures, and reporting errors, can adversely affect patient care and treatment outcomes. Therefore, strict radiation protection principles such as ALARA, proper patient preparation, quality assurance programs, regular equipment maintenance, and skilled healthcare professionals are essential to ensure patient safety and diagnostic accuracy. Radiology continues to play a vital role in modern healthcare by improving early disease detection and supporting effective clinical management.**

Index Terms— **Radiology, Ionizing Radiation, Medical Imaging, Radiation Safety, Silent Errors**

Introduction

Radiology is an important branch of modern medicine that uses different imaging techniques to look inside the human body without surgery. It helps doctors to diagnose diseases, monitor conditions, and guide treatment in a safe and effective way.

Radiology has become a key part of healthcare because many diseases cannot be identified only by physical examination. Imaging allows doctors to see internal organs, bones, and tissues clearly, which improves accuracy in diagnosis and patient care.

There is several common imaging methods used in radiology:

X-ray: Mainly used to detect bone fractures and chest conditions Xray. X-rays are a way for healthcare providers to get pictures of the inside of your body. X-rays use radiation to create black-and-white images that a radiologist reads. Then, they send a report to your provider. X-rays are mostly known for looking at bones and joints. But providers can use them to diagnose other conditions, too. It works on the principle of the An X-ray generator, which is the device in an X-ray machine that produces X-rays. It generally contains an X-ray tube, which, in most cases, uses radioisotopes to generate X-rays. An X-ray tube has an electrode pair, a cathode (that directs a stream of electrons into a vacuum) and an anode (made of tungsten to evacuate heat generated by the collision, while collecting the electrons). The electrons collide with the target, and the resulting energy is emitted as heat (99%) and X-rays (only 1%). Thereby, an X-ray generator needs to have a cooling system.

Computed Tomography (CT): Provides detailed cross-sectional images of the body. CT scans are created using a series of x-rays, which are a form of radiation on the electromagnetic spectrum. The scanner emits x-rays towards the patient from a variety of angles – and the detectors in the scanner measure the difference between the x-rays that are absorbed by the body, and x-rays that are transmitted through the body. This is called an attenuation. The amount of attenuation is determined by the density of the imaged tissue, and they are individually assigned to a Hounsfield Unit or CT Number.

Magnetic Resonance Imaging (MRI): Useful for soft tissues like brain, spine, and muscles. MRI scans work as an imaging method due to the unique make-up of the human body. We are comprised entirely of cells which all contain water – principally made of hydrogen ions (H_2O). The magnet embedded within the MRI scanner can act on these positively charged hydrogen ions (H^+ ions) and cause them to 'spin' in an identical manner. By varying the strength and direction of this magnetic field, we can change the direction of the 'spin' of the protons, enabling us to build layers of detail.

When the magnet is switched off, the protons will gradually return to their original state in a process known as precession. Fundamentally, the different tissue types within the body return at different rates, and it is this that allows us to visualize and differentiate between the different tissues of the body.

Ultrasound: Uses sound waves and is commonly used in pregnancy and abdominal studies. The principle of ultrasound is based on the use of high-frequency sound waves (usually 1–15 MHz) to create images of structures inside the body. These sound waves are produced by a device called a transducer. When the transducer is placed on the body, it sends sound waves into the tissues. As these waves travel through the body, they hit different structures such as organs, fluids, or bones. Each structure reflects the sound waves back differently. These returning waves are called echoes. The ultrasound machine receives these echoes and converts them into real-time images on a screen. The time taken for the echoes to return and their strength helps in forming the image. Positron Emission Tomography (PET): It is an advanced imaging technique used in radiology to study the functional and metabolic activity of tissues and organs. In this technique, a small amount of radioactive tracer (commonly FDG – fluorodeoxyglucose) is injected into the patient. This tracer behaves like glucose and gets collected in active cells, especially in areas like tumors where metabolism is high. The radioactive tracer emits positrons (positively charged particles). When a positron meets an electron in the body, they undergo a process called annihilation, producing two gamma rays that travel in opposite directions. These gamma rays are detected by the PET scanner’s detectors arranged in a ring around the patient. The system then processes this information to create detailed images showing functional activity inside the body. Single Photon Emission Computed Tomography (SPECT): It is an advanced nuclear medicine imaging technique used to evaluate the function and blood flow of organs. In this method, a small amount of radioactive tracer is injected into the patient’s body, which emits gamma rays. These rays are detected by a special camera (gamma camera) that rotates around the patient to create three-dimensional images. The principle of SPECT is based on the detection of gamma rays emitted directly from a radioactive tracer inside the body to study organ function and blood flow. In this technique, a small amount of radioactive tracer is injected into the patient. This tracer travels to specific organs such as the heart, brain, or bones and emits single gamma photons. A special device called a gamma camera rotates around the patient and detects these gamma rays from different angles. The collected data is then processed by a computer to create three-dimensional (3D) images of the organ. Dual-Energy X-ray Absorptiometry (DEXA): It is a specialized imaging technique used to measure bone mineral density (BMD). It works by using two low-dose X-ray beams at different energy levels to assess the strength and density of bones, most commonly at the hip and spine. The principle of DEXA is based on the use of two X-ray beams of different energy levels to measure bone mineral density (BMD). When these two X-ray beams pass through the body, they are absorbed differently by bone and soft tissues. Bones absorb more X-rays, while soft tissues absorb less. The DEXA machine compares the absorption of the two energy beams and calculates the density and strength of the bone. This difference in absorption allows the system to produce very accurate measurements of bone density, especially in areas like the hip and spine. Radiological techniques and procedures form the backbone of modern diagnostic medicine by providing accurate and non- invasive insight into the human body. Methods such as X-ray, CT, MRI, ultrasound, along with advanced techniques like PET, SPECT, DEXA, and Doppler ultrasound, have significantly improved the early detection, diagnosis, and management of diseases. Each technique has its own role, advantages, and specific clinical applications, making radiology a diverse and essential field in healthcare.

Fig : 01 X-Ray

Fig: 02 CT Scan

Fig: 03 MRI

Fig : 04 Ultrasound

Fig: 05 PET Scan.

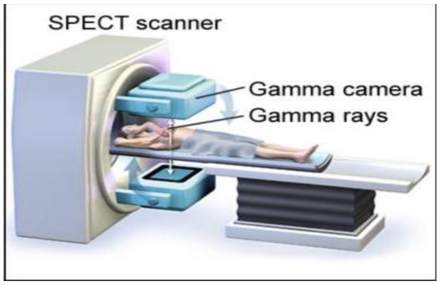

Fig: 06 SPECT Scanner

Radiology machines use different types of radiation depending on the technique. Some machines, like X-rays, CT scan, and DEXA, use X-rays, which are a form of ionizing radiation. Similarly, PET and SPECT scans use radioactive tracers that produce gamma rays inside the body. These types of radiation have enough energy to affect body cells and, in high or repeated doses, can cause damage to DNA and increase the risk of cancer. However, in medical use, the dose is carefully controlled to keep it as safe as possible. On the other hand, some imaging methods do not use harmful radiation. MRI works with magnetic fields and radio waves, and ultrasound (including Doppler) uses sound waves. These are considered much safer because they do not damage body cells and can be used multiple times, even in sensitive cases like pregnancy. Radiation can be classified as either ionizing or non-ionizing. The different types of radiation are classed based on how much energy it has. Ionizing radiation refers to radiation that has enough energy to break an electron away from an atom, a process called ionization. Ionizing radiation, also spelled ionizing radiation, consists of subatomic particles or electromagnetic waves that have enough energy per individual photon or particle to ionize atoms or molecules by detaching electrons from them. Some particles can travel up to 99% of the speed of light, and the electromagnetic waves are on the high-energy portion of the electromagnetic spectrum. Ionizing radiation surrounds us everywhere in everyday life and is completely unavoidable and is safe at low doses. Living in Australia for one year will expose you to an average of 1.7 mSv of background radiation – an amount that is completely safe to receive every year during your life. A dose of 1000 times larger than this annual average would be required to cause harmful deterministic effects.

Non-ionizing radiation differs from ionizing radiation in the way it acts on materials like air, water, and living tissue. Unlike x-rays and other forms of ionizing radiation, non-ionizing radiation does not have enough energy to remove electrons. Non- ionizing radiation can heat substances. For example, the microwave radiation inside a microwave oven heats water and food rapidly. In radiology, non-ionizing radiation is used in techniques like MRI, which works with magnetic fields and radio waves, and ultrasound, which uses high-frequency sound waves to create images of the body. These methods are widely used because they can produce detailed images without exposing patients to harmful radiation. Although non-ionizing radiation is much safer, it is still important to use it properly. For example, MRI requires strict safety precautions due to strong magnetic fields, and ultrasound depends on the correct technique for accurate results. Overall, non-ionizing radiation plays a very important role in medical imaging by providing a safe and effective way to examine the body. Radiation is a form of energy that travels as waves or particles and can be either ionizing or non-ionizing. Ionizing radiation, such as X-rays and gamma rays, has enough energy to remove electrons from atoms, which can lead to damage to human tissues and the environment. In the human body, radiation primarily affects cells by damaging DNA directly or by producing free radicals that harm cellular structures. This damage can result in cell death, mutations, or uncontrolled cell growth, which may lead to cancer. The effects depend on the dose and duration of exposure. High doses over a short period can cause immediate health problems known as deterministic effects, including skin burns, hair loss, nausea, vomiting, and in severe cases, acute radiation sickness and organ failure. On the other hand, low doses over a long period may not show immediate symptoms but can increase the risk of long-term effects such as cancer and genetic mutations; these are known as stochastic effects. Certain organs like bone marrows, thyroids, reproductive organs, and eyes are more sensitive to radiation. Exposure during pregnancy is especially dangerous, as it can affect the developing fetus, leading to growth problems, birth defects, or increased risk of childhood cancers. Radiation also has significant effects on the environment. When released into the surroundings, especially during nuclear accidents or improper disposal of radioactive waste, it can contaminate soil, water, and air. Radioactive substances can remain in the environment for many years, depending on their half-life, and can enter the food chain through plants and animals, a process known as bioaccumulation. This can lead to long-term exposure to humans and wildlife. Plants exposed to radiation may show reduced growth, mutations, and decreased productivity, while animals may suffer from birth defects, reduced fertility, and increased mortality. Over time, radiation can disrupt entire ecosystems by reducing biodiversity and making certain areas unsafe for living. One of the most concerning aspects of radiation exposure is that its effects are often delayed and not immediately visible, which makes it a “silent hazard.” Therefore, while radiation is highly beneficial in fields like medicine, its use must be carefully controlled to protect both human health and the environment. Radiation can affect the human body in different ways depending on the dose, duration, and type of exposure, and these effects are mainly classified into deterministic and stochastic effects. Deterministic effects occur when the radiation dose is high and exceeds a certain threshold, and their severity increases with the amount of exposure. These effects usually appear quickly and include symptoms such as skin burns, redness, hair loss, nausea, vomiting, and in severe cases, acute radiation sickness and organ damage, especially to the bone marrow. On the other hand, stochastic effects occur due to low or prolonged exposure and do not have a fixed threshold. These effects are delayed and may appear after many years. The most common stochastic effects include cancer and genetic mutations, where the probability of occurrence increases with dose, but the severity is not directly related to it. In addition, radiation can also cause genetic effects, which may affect future generations, and teratogenic effects, which can harm a developing fetus, leading to birth defects or growth problems. Overall, radiation effects can be immediate or long-term, making it important to control exposure and follow proper safety measures. In addition to the risks associated with radiation itself, the use of radiological equipment requires high accuracy and proper handling. Even small mistakes made by technicians or healthcare professionals—such as incorrect patient positioning, wrong exposure settings, improper use of contrast, or errors in image interpretation—can lead to misdiagnosis, unnecessary radiation exposure, or delayed treatment. These errors are often not immediately visible and are referred to as silent errors, as their impact may only become apparent later. To minimize these risks, it is essential to follow strict radiation safety principles and standard operating procedures in every radiological practice. One of the most important principles is ALARA (As Low As Reasonably Achievable), which means that radiation exposure should always be kept to the minimum level necessary to achieve a proper diagnosis. This can be done by using correct exposure factors, proper shielding, and avoiding unnecessary repeat examinations. In addition, proper training and awareness of radiology staff play a crucial role in reducing errors. Technicians must be well-trained in handling equipment, patient positioning, and understanding imaging protocols. Regular quality control and maintenance of machines are also important to ensure accurate performance and avoid technical faults that may lead to incorrect results. Effective communication between healthcare professionals, including radiologists, technicians, and referring doctors, is another key factor in preventing mistakes. Clear instructions, proper patient identification, and verification of clinical details can significantly reduce the chances of error. Furthermore, the use of checklists and double-check systems can help identify mistakes before they affect the patient. With advancements in technology, tools like digital imaging systems and artificial intelligence are also being used to assist in improving accuracy, although human supervision remains essential. Radiology is one of the most important tools in modern medicine, helping doctors see inside the body and make accurate diagnoses. However, not all errors in radiology are obvious. Some mistakes happen quietly and are not noticed at the time they occur. These are known as silent errors—errors that remain hidden but can still seriously affect patient care and outcomes. Silent errors can occur at different stages of the radiology process, including image acquisition, processing, and interpretation. For example, a small fracture may be missed on an X-ray, a tumor may not be identified on a CT scan, or a wrong patient detail may be entered into the system. These mistakes may not be immediately visible, but they can lead to wrong diagnosis, delayed treatment, or unnecessary procedures, causing harm to the patient. One of the main reasons silent errors occur is human factors, such as fatigue, lack of experience, poor communication, or overconfidence. Technical issues like improper machine settings, poor image quality, or equipment malfunction can also contribute to the problem. In many cases, these errors are not detected until the patient's condition worsens or another test is performed. The impact of silent errors can be serious. Patients may suffer physically, emotionally, and financially due to incorrect or delayed diagnosis. In some cases, it may even lead to life-threatening situations. This makes it very important to focus on error prevention and patient safety in radiology. To reduce silent errors, it is essential to follow proper protocols, ensure adequate training of staff, maintain equipment regularly, and encourage clear communication among healthcare professionals. Double-checking reports, using checklists, and adopting advanced technologies can also help in minimizing these hidden mistakes. Silent errors in radiology are mistakes that are not immediately noticed but can still have serious effects on patient care. One of the most common types is a missed diagnosis, where a radiologist fails to identify an abnormality such as a small fracture, tumor, or lesion on an image. Another type is misinterpretation, where the abnormality is seen but wrongly identified as normal or something less serious. Errors can also occur in patient identification, where images are assigned to the wrong patient, leading to incorrect diagnosis and treatment. Similarly, wrong side marking or labeling errors can result in confusion and even wrong-site procedures.Technical mistakes, such as poor patient positioning, incorrect exposure settings, or motion blur, can produce low-quality images, making it difficult to detect abnormalities. In some cases, important examinations may be missed, or unnecessary repeat scans may be performed, causing delays or extra radiation exposure. Communication errors can also happen when critical findings are not properly shared with the referring doctor, and reporting errors, such as typing mistakes or copy- paste issues, can further add to the problem. These errors are dangerous because they often go unnoticed at the time but can later lead to delayed diagnosis, wrong treatment, and harm to the patient.

AIM AND OBJECTIVE

AIM:

- SILENT ERROR IN RADIOLOGY MISTAKE WE DONT SEE BUT THE PATIENTS SUFFERS

OBJECTIVE:

- To identify and understand the different types of silent errors that occur in radiology practices which are not immediately visible but can affect patient outcomes.
- To assess the level of awareness among radiology professionals regarding silent errors and their consequences. To study the impact of these hidden errors on patient safety, diagnosis of accuracy, and treatment planning.
- To understand the role of training, education, and continuous monitoring in minimizing human and technical mistakes.

REVIEW LITERATURE

3.1 The study was conducted by **Evan J. Zucker MD, Richard A. Barth MD "Impact of California Computed Tomography Dose Legislation: Survey of Radiologists" Department of Radiology, Lucile Packard Children's Hospital, Stanford University School of Medicine, Stanford, California, USA https://doi.org/10.1016/j.jmir.2017.02.072** This study mentioned the highly publicized accounts of radiation overdose from computed tomography (CT) in both children and adults prompted legislation in California regulating CT dose. The purpose of this study was to determine the impact of the law (codified in Senate Bill [SB] 1237) on California radiologist practice patterns and understanding of CT dose. Of 1,300 surveyed, 138 (11%) responded; 132 of 137 (96%) were familiar with SB 1237. Of 135 responding, 126 and 115 (93% and 85%, respectively) knew to report CT dose indexvolume and dose-length product. Sixty of 134 (45%) attributed dose reporting to an increased awareness of appropriate dose ranges. Twenty-nine of 133 (22%) had modified protocols in concert with SB 1237s enactment. Of 31 responding, 5 (16%), 23 (74%), and 3 (74%) had modified protocols in only children, both adults and children, and only adults, respectively. Twenty-four of 129 (19%) utilized automated dose reporting; 48 (37%) and 57 (44%) used dictation/transcription and template-assisted voice recognition, respectively. Forty of 134 (30%) noted delays finalizing CT reports. Most radiologists who responded in our sample were familiar with SB 1237. Nearly half attributed dose reporting to an increased awareness of appropriate dose ranges. Almost one quarter indicated protocol modifications, the majority including children, occurring in conjunction with the law. Reporting inefficiency was a common concern.

3.2 The study was conducted by **Josef Haik [a], Simon Daniel [b], Ariel Tessone [a], Arie Orenstein [a], Eyal Winkler [a]Department of Plastic & Reconstructive Surgery and Burn Unit, The Chaim Sheba Medical Center at Tel HaShomer 52600, IsraelSackler School of Medicine, Tel Aviv University, Israel "MRI induced fourth degree burn in an extremity, leading to amputation" https://doi.org/10.1016/j.burns.2007.11.008** This study mentioned that though the risk of magnetic resonance imaging (MRI) induced burns has been previously published, the overwhelming nature of this injury combined with its preventable etiology, merit reiteration of the morbidity associated with the use of non-MR-compatible devices in MRI sessions. After describing the patient's details, they provide guidelines aimed at decreasing the potential risk of burns during routine magnetic resonance imaging.

3.3 THE STUDY WAS CONDUCTED BY **EDMOND W. ISRAELSKI AND WILLIAM H. MUTOVIEW ALL AUTHORS AND AFFILIATIONS**

Volume 47, Issue 12 "Use-Error Focused Risk Analysis for Medical Devices: A Case Study of the Therac-25 Radiation Therapy System"https://doi.org/10.1177/154193120304701241 This study show Risk analysis or hazard analysis has been used as an engineering tool for many years to identify system risks and control system modes of failure. In alignment with the recent emphasis on patient safety, the tools of risk analysis have seen increased attention. These tools and related methods have been applied to understanding "use-errors" made with medical devices. Use errors are defined as a pattern of predictable human errors that can be attributable to inadequate or improper design. Use-errors can be predicted through analytical task walkthrough techniques and via empirically based usability testing. This paper explores the methodology of use-error focused risk analysis and some of its history. An example is offered on how it can apply to a well-known but no longer marketed medical device

3.4 This study was conducted by **David L. Francia, Kathy P. Willowson and Dale L. Bailey Journal of Nuclear Medicine Technology December 2022, 50 (4) 381-383; "An Unusual Cause of γ-Camera Contamination "DOI: https://doi.org/10.2967/jnmt.122.264172** . This study shows the γ-camera can arise from several causes both external to the scanning system and in the system itself. Early assessment using translation and rotation of the detectors should determine whether the contamination has a fixed geometry relative to the system or is external. Using physical characteristics such as the photon energy of the contamination and half-life can help to identify the radionuclide and, therefore, the potential cause of the contamination. In this case, a single human hair that had become contaminated with ^{131}I, presumably due to saliva, was able to become lodged between the underside of the collimator and the detector surface.

3.4 This study was conducted by J. Romesburg and M. Ragozzino American Journal of Neuroradiology May 2009, 30

(5) 1074-1075;" Aseptic Meningoencephalitis after Iohexol CT Myelography" DOI: https://doi.org/10.3174/ajnr.A1365 This study shows the case of a patient with aseptic meningoencephalitis after intrathecal iohexol injection for myelography and review the previous literature on similar cases of contrast-induced neurotoxicity. Aseptic meningoencephalitis is a rare complication of myelography with nonionic, iodinated, water-soluble contrast agents. We describe a case of a 69-year-old woman in whom aseptic meningoencephalitis developed after she underwent iohexol myelography. In general, iohexol is a safe and effective contrast agent for CT myelography. Clinicians should be aware of the rare occurrence of aseptic meningoencephalitis related to myelography. The clinical symptoms, timeline, and CSF analysis are helpful to differentiate aseptic meningoencephalitis from other complications of myelography.

3.5 This study was conducted by Joseph Lunyera, Dinushika Mohottige, Anastasia-Stefania Alexopoulos, et al. Risk for Nephrogenic Systemic Fibrosis After Exposure to Newer Gadolinium Agents: A Systematic Review. Ann Intern Med.2020;173:110-119. [Epub 23 June 2020]. "**Risk for Nephrogenic Systemic Fibrosis After Exposure to Newer Gadolinium Agents**" doi:10.7326/M20-0299 This study shows the evidence about NSF risk with newer versus older GBCAs across the spectrum of kidney function. Although NSF occurrence after exposure to newer GBCAs is very rare, the relatively scarce data among patients with acute kidney injury and those with risk factors for chronic kidney disease limit conclusions about safety in these populations.

MATERIALS AND METHODS

Study Design

The present study was conducted as a review-based descriptive study to understand silent errors in radiology and their impact on patient safety, diagnosis, and treatment outcomes. The study focused on identifying hidden mistakes occurring during radiological procedures and analyzing their causes, effects, and preventive measures.

Study Area

The study was carried out in the field of diagnostic radiology and medical imaging, including imaging modalities such as X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound, Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT), and Dual-Energy X-ray Absorptiometry (DEXA).

Materials Used

The materials used in this study included:

- Research articles and review papers related to radiology errors and radiation safety.
- Medical journals, online databases, and published literature.
- Information regarding radiological imaging techniques and radiation hazards.
- Case studies related to silent errors, patient safety incidents, and radiation exposure.
- Standard radiology safety guidelines and ALARA principles.

Data Collection Method

Data for the study were collected from secondary sources such as:

- Published scientific journals
- Research articles
- Radiology textbooks
- Online medical databases and websites
- Previous case reports and literature reviews

Inclusion Criteria

- Studies related to radiology and diagnostic imaging.
- Articles discussing silent errors, radiation exposure, and patient safety.
- Literature related to imaging modalities such as CT, MRI, PET, SPECT, Ultrasound, and X-ray.
- Published articles from recognized medical and scientific journals.

Exclusion Criteria

- Non-medical articles unrelated to radiology.
- Incomplete studies or reports without proper findings.
- Duplicate research articles.

Methodology

- Human errors such as misinterpretation, poor communication, fatigue, and incorrect patient identification.
- Technical errors including equipment malfunction, improper exposure settings, and poor image quality.
- Radiation-related risks and safety measures.
- Preventive strategies such as quality assurance programs, staff training, ALARA principles, and double-check systems.

CONCLUSION

Radiology plays a vital role in modern healthcare by helping doctors diagnose diseases accurately and guide appropriate treatment through various imaging techniques such as X-ray, CT, MRI, Ultrasound, PET, SPECT, and DEXA. Although these technologies have greatly improved medical diagnosis and patient management, they also involve certain risks related to radiation exposure and hidden mistakes known as silent errors. Silent errors in radiology are dangerous because they are often not immediately recognized but can seriously affect patient safety and treatment outcomes. Errors such as misdiagnosis, poor image quality, wrong patient identification, communication failures, and technical faults may lead to delayed treatment, unnecessary radiation exposure, or incorrect medical decisions. Human factors such as fatigue, lack of training, stress, and overconfidence, along with technical and system-related problems, are major contributors to these hidden errors. The study highlights the importance of radiation protection principles like ALARA, proper patient positioning, quality assurance programs, equipment maintenance, and effective communication among healthcare professionals. Regular staff training, use of standardized protocols, double-check systems, and advanced digital technologies can significantly reduce the occurrence of silent errors in radiology departments. In conclusion, while radiology is one of the most valuable tools in medical science, maintaining patient safety and diagnostic accuracy requires continuous monitoring, awareness, and strict adherence to safety standards. Reducing silent errors is essential to improve healthcare quality, protect patients from unnecessary harm, and ensure reliable radiological practice.

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