Navigating Radiologic Students Practice: Satisfaction With Equipment And Devices In Najran Hospitals, Saudi Arabia

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ABSTRACT

Radiology is a branch of the medical field that utilizes ionizing radiation and imaging technology for both diagnostic and therapeutic purposes.

The unavailability of training for radiology students poses a significant barrier to enhancing their skills, stemming from insufficient equipment and imaging tools or a shortage of attendees at training sessions. This limits students' preparedness to tackle real-world challenges. A shortage of practical training and equipment and devices results in insufficient hands-on experience for radiology students, impacting their skills and efficiency. Additionally, without practical experiments, students may struggle to fully grasp theoretical concepts. The aim is to assess satisfaction with equipment and devices in Najran hospitals while radiology students navigating in practice.

This research was a descriptive cross-sectional study, utilizing a systematically designed questionnaire distributed via WhatsApp and Telegram applications to gather data. was responded to by radiology students in order to gather specific information aimed at evaluating the difficulties encountered by radiology and medical imaging students in relation to clinical training. The study sample comprised radiology students from levels five to nine, with a total of 96 respondents, including 29. 2% of males and 70.8% of females. The findings indicated that students encounter problems due to the disparity between the number of trained students and the capacities of hospitals. This research was carried out among Najran University students in the Department of Radiological Sciences who received training in Najran hospitals, such as King Khalid Hospital, Maternity and Children Hospital, and Najran General Hospital, located in Najran region (Saudi Arabia). The data were examined with Excel 2013, and the outcomes showed that although the students encountered challenges, most were pleased with the clinical training experience, which they deemed beneficial for improving their knowledge and skills.

1. Introduction

Training in hospital radiology departments is a comprehensive process that aims to provide healthcare professionals, including radiologists, radiology technicians, and residents, with the knowledge and skills necessary to perform and interpret medical imaging effectively. This training refines and develops skills in dealing with various devices and modern technologies, raises the level of competence of trainees, ensures safety standards, and prepares them to respond to the challenges they face while dealing with complex cases. Training is not limited to a specific period but should be a continuous process throughout their careers due to rapid technological developments and discoveries. Training covers several key areas:[1]

Basic Knowledge: Trainees start with the basics of anatomy and physiology and the principles of various medical imaging techniques such as X-ray, MRI, CT, and ultrasound. They are taught how these techniques work, along with basic physics, and how to use equipment related to these techniques and radiation protection equipment such as lead aprons, coils, etc. These fundamentals allow trainees to recognize pathological changes in tissues and organs, which helps them make sound treatment decisions.[2]

Clinical Hands-On Experience: In a hospital setting, trainees work closely with senior radiologists and technicians and actively participate in diagnostic imaging sessions. This enhances their scientific skills through active participation in imaging procedures. In addition, they receive intensive training on radiation and safety procedures to protect patients and health workers. They learn how to operate the machines, adjust settings, and perform imaging procedures correctly and safely.[1] Furthermore, trainees work as an integral part of a multidisciplinary healthcare team. Hands-on training enhances students' ability to collaborate with multidisciplinary medical teams, which is essential for improving the quality of healthcare. As healthcare systems evolve and the demand for quality assurance grows, training must focus on continuous performance improvement, as seen in programs such as Maintenance of Certification, which emphasizes lifelong learning and professional development.[1] In conclusion, practical training is more than just an educational experience; it is essential for shaping a generation of skilled radiology professionals who are well-prepared to tackle the daily challenges of the field and contribute to improved healthcare outcomes.

Radiology has benefited from a unique combination of science and technology in medicine, leading to numerous advances in imaging expertise.[3] Since the inception of radiation technology, it has evolved significantly, beginning with conventional radiography in 1895 and progressing to various technologies that utilize radiation to generate images of internal body structures. Various techniques have been established by scientists and engineers to create radiological modalities for different purposes, including X-ray, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound imaging, among others. Despite advancements in radiology technology, challenges such as errors and inaccuracies in each modality's equipment and devices persist [8]. Diagnostic radiology is a dynamic specialty that continues to evolve rapidly with ongoing technological advancements [4]. The number of imaging methods has increased, and each method undergoes continuous improvement and refinement for medical diagnosis. This chapter reviews the fundamentals of the major diagnostic imaging methods and their equipment [4].

2. Radiology Modalities

X-ray Machine: An X-ray machine is a medical device that uses X-ray radiation to produce images of the body's internal structures. It directs X-rays through the body, which are absorbed at varying degrees by different tissues, capturing the resulting images on film or a digital detector. This process assists healthcare professionals in diagnosing conditions such as fractures, infections, and tumours [5]. X-ray machines are commonly utilized in hospitals and clinics for diagnostic purposes. The essential components of this device include:[9]

X-ray Tube: Comprising a cathode (negative electrode) and an anode (positive electrode), it generates X-rays when high-voltage electricity is applied.[5]

Control Panel: Allows the operator to modify settings such as exposure time, kilovoltage (kV), and milliamperage (mA), including various safety features and controls.[6]

Image Receptor: Captures the X-ray images, which can be either film-based or digital (e.g., flat-panel detectors).

Collimator: Restricts the X-ray beam to the area of interest, reducing patient exposure and enhancing image quality.

Support Structures: Includes the X-ray tube stand, patient table, and additional supports for proper patient positioning (e.g., sandbags, straps, or restraints).

Filtration: Typically made of aluminum, it eliminates low-energy X-rays that do not improve image quality, thus lowering the patient's dose.[6]

Protective Shields: Comprises lead aprons or barriers designed to shield patients and staff from unnecessary radiation exposure.[7]

Computer System (for digital setups): Processes and stores the X-ray images, enabling further manipulation and analysis. [5]

Fluoroscopy: Fluoroscopy systems consist of several key components that work together to create real-time imaging. Here are the main components:[8]

X-ray Tube: Generates X-rays that pass through the patient and create the image. Often located below the patient table.[8]

Image Intensifier / Flat Panel Detector: Converts the X-ray photons into visible light or electrical signals for digital imaging. Image intensifiers amplify

the brightness of the image for viewing. Modern systems may use flat panel detectors (FPDs) that offer better image quality and reduced radiation dose.

Collimator: Controls the size and shape of the X-ray beam to reduce patient exposure. Typically equipped with adjustable shutters or diaphragms.

Table: Supports the patient and allows for movement to achieve the best imaging angle. Some tables can tilt or rotate to assist with positioning.[9]

X-ray Generator: Supplies the necessary power to the X-ray tube and controls the voltage (kVp) and current (mA) for optimal image quality.[10]

Monitor/Display: Displays the real-time images generated by the fluoroscopy system. May have multiple screens for different views or comparisons.[10]

Digital Imaging System: Captures, processes, and stores the fluoroscopic images. Provides features like image enhancement, zoom, and playback.[11]

Radiation Shielding: Includes lead aprons, thyroid collars, and lead glass screens for radiation protection. Protects both patients and healthcare staff.[11]

Control Panel: Used by the operator to adjust settings such as X-ray intensity, exposure time, and image capture.[12] May include foot switches or hand controls.

These components work together to ensure accurate and safe imaging for diagnostic or interventional procedures.[12]

Dual-energy X-ray Absorptiometry (DEXA): Bone densitometry, also called dual-energy x-ray absorptiometry, DEXA or DXA, uses a very small dose of ionizing radiation to produce pictures of the inside of the body (usually the lower (or lumbar) spine and hips) to measure bone loss. It is commonly used to diagnose osteoporosis and assess an individual's risk for developing osteoporotic fractures. DXA is simple, quick, and noninvasive. It's also the most commonly used and standard method for diagnosing osteoporosis.[13]

Accessories for DEXA Examinations

Effective DEXA scans require a number of add-ons and parts, including:

X-ray Source: To differentiate between soft tissue and bone, the device has an X-ray generator that emits two X-ray beams with varying energies.

Detector: A sensitive detector that records X-rays as they go through the body and produces pictures that can be used to determine body composition or bone density.

Positioning Devices: The patient is properly positioned using cushions, wedges, and pads to ensure accurate and repeatable results, particularly for hip and spinal measures.

Software: The DEXA machine's data is interpreted by specialized analytic software, which computes bone mineral density and generates reports that physicians can utilize to evaluate their patients' health

Radiation Shielding: Safety gear such as lead aprons is used to protect both patients and healthcare staff during examinations.[13]

Mammogram: It is a type of specialist medical imaging that looks into the breasts using a low-dose x-ray machine. A mammogram, also known as a mammography exam, helps women with breast disorders by detecting and diagnosing them early. Doctors use x-ray exams to identify and cure illnesses. It creates images of the inside of your body by exposing you to a tiny amount of ionizing radiation. The most traditional and widely utilized type of medical imaging is X-rays.[14]Digital mammography, also called full-field digital mammography (FFDM), is a mammography system in which the x-ray film is replaced by electronics that convert x-rays into mammographic pictures of the breast.[15] Computer-aided detection (CAD) systems search digitized mammographic images for abnormal areas of density, mass, or calcification that may indicate the presence of cancer. Breast tomosynthesis, also called three-dimensional (3-D) mammography and digital breast tomosynthesis (DBT), is an advanced form of breast imaging where multiple images of the breast from different angles are captured and reconstructed ("synthesized") into a three-dimensional image set. In this way, 3-D breast imaging is similar to computed tomography (CT) imaging in which a series of thin "slices" are assembled together to create a 3-D reconstruction of the body. Mammography Accessories:

Compression Paddle: This transparent paddle, which is an essential component of the mammography procedure, flattens the breast for an even Xray distribution, lowering radiation dose and enhancing image quality.[15]

Breast Positioning Devices: These attachments, which are made to guarantee that the breast is positioned correctly, reduce discomfort while maintaining precise imaging.

Lead Aprons: Although the radiation from mammography is quite low, they are occasionally employed to shield certain body regions from needless radiation exposure.

Digital Detectors: These are used in digital mammography to take X-ray pictures, which are then shown on a computer for instant viewing.

Magnification Tools: Occasionally employed to get fine-grained pictures of certain areas.[15]

Panoramic Dental X-ray: A two-dimensional (2-D) dental x-ray examination known as panoramic radiography, or panoramic x-ray, takes a single picture of the complete mouth, including the teeth, upper and lower jaws, and surrounding tissues and structures.[16] The jaw resembles a horseshoe in its bent shape. On the other hand, the curving structure appears flat in the panoramic x-ray. Usually, it gives information on the teeth and bones.[20] Doctors use x-ray exams to identify and cure illnesses. It creates images of the inside of your body by exposing you to a tiny amount of ionizing radiation. The most traditional and widely utilized type of medical imaging is X-rays.In contrast to a conventional intraoral x-ray, which involves inserting the film and x-ray detector into the mouth. Accessories Used in Panoramic X-rays:

X-ray Tube: Generates the X-rays that pass through the patient's jaw to create the image.

Rotating Arm: The machine's arm moves in a semicircular motion around the patient's head to capture the full panoramic image.[17]

Bite Block: This is a small device that the patient bites onto during the scan to ensure their teeth and jaw are properly aligned for an accurate image.

Chin Rest/Head Positioner: Keeps the head steady and aligned during the scan to prevent movement and blurring of the image.

Digital Sensors: These sensors capture the X-rays after they pass through the patient, converting them into digital images that are then displayed on a monitor.

Lead Apron: Worn by the patient to protect other parts of the body from unnecessary radiation exposure during the X-ray.

Panoramic X-rays are a quick and painless procedure that offers valuable insight into oral health, aiding dentists and oral surgeons in diagnosis and treatment planning.[17]

Ultrasound: Ultrasound (also called sonography or ultrasonography) is a noninvasive imaging test. An ultrasound picture is called a sonogram. Ultrasound uses high-frequency sound waves to create real-time pictures or video of internal organs or other soft tissues, such as blood vessels[18] . Equipment Used in Ultrasound:

Transducer: The transducer sends and receives the sound waves. If you have seen an ultrasound machine, the transducer is the small handheld probe that the technician uses. In early devices, sending and receiving these waves was done by two different units.[19]

Central Processing Unit (CPU): The Central Processing Unit is the brain behind an ultrasound machine. It coordinates the different signals emitted and received by the transducer, interpreting the electrical signals in the form of a visual image on the monitor.

Display: The display or monitor shows the image of what the transducer is scanning. This allows the doctor to analyze the image before creating their diagnosis. It also enables the technician to navigate to the exact area that requires ultrasound imaging.

Control Knobs: Control knobs enable the technician to adjust settings for ultrasound scans to get a clear picture on the display. Other functions include zooming in and out.

Keyboard: Keyboards are used during ultrasound scans to enter patient data. Entering patient data allows every image to be saved correctly in the patient file. Storing patients' ultrasounds with their data helps maintain accurate patient records on any digital medium.

Printer: The printer is used to print a hard copy of the ultrasound image. The hard copy can be used for examination by another doctor or saved in a patient's file for use later. Hard copies of images are also given to expecting parents as a picture of their child.[19]

Nuclear medicine: a medical specialty that uses small amounts of radioactive materials (radiopharmaceuticals) to diagnose and treat diseases. Unlike traditional anatomical imaging methods such as X-rays, nuclear medicine focuses on imaging body functions and detecting functional changes, making it unique in its approach.[20]

Components of Nuclear Medicine:

Radiopharmaceuticals: These are radioactive materials administered to the patient either through injection, ingestion, or inhalation. They are usually composed of a compound that targets a specific area of the body, such as the bones, heart, or kidneys, and carry a radioactive isotope.[21]

Gamma Camera: A gamma camera is a device sensitive to radiation, used to capture the emissions from the radiopharmaceutical inside the body. It records these emissions and converts them into three-dimensional images of the targeted organ. **PET and SPECT Scanners:** PET (Positron Emission Tomography) and SPECT (Single Photon Emission Computed Tomography) are imaging techniques that use radioactive substances to provide detailed functional images. PET focuses on metabolic activity, while SPECT gives more detailed images of the organ's function.

Detectors: These devices detect and measure the radiation emitted by the radiopharmaceuticals, converting these signals into visual data to create images.[21]

Computed Tomography (CT): The development of Computed Tomography (CT) in the early 1970s revolutionized medical radiology. Also known as CT scan, it is a medical imaging technique that combines multiple X-ray images taken from different angles and uses computer processing to create cross-sectional images or slices of bones, organs, and other tissues inside the body. The advantage of these tomographic images compared to conventional X-rays is that they contain detailed information of a specified area in cross-section, eliminating the superimposition of images, which provides a tremendous advantage over plain films. These detailed images allow for accurate diagnosis and evaluation of various medical conditions.

Components of Computed Tomography:[22]

The Machine: It consists of an X-ray tube that rotates around the patient, with detectors on the opposite side. The tube rotates around the patient while multiple images are taken from different angles.[23]

Computer Unit: It processes the data collected by the detectors and converts it into cross-sectional images. Image processing techniques are employed to adjust and enhance image quality.

Examination Table: This is where the patient lies during the scan. The table automatically moves into the machine to allow imaging of different body areas. Imaging Software**:** This includes software used to analyze and prepare the images for medical use, including advanced analysis applications.

Control Unit: Used by technicians to set up the scan and determine parameters such as the required radiation dose and appropriate angles.

Shielding Devices: Lead aprons, shields, and other protective gear are used to minimize radiation exposure to the patient and staff.

Coils: Special devices, though less common in CT, may be used for specific types of imaging or to enhance image quality in some advanced CT systems. CT is an effective tool for diagnosing medical conditions such as tumors, internal bleeding, and structural injuries.[23]

Magnetic Resonance Imaging (MRI): a non-invasive medical imaging technique used to obtain detailed images of the body's internal structures, particularly soft tissues such as the brain, spinal cord, muscles, and internal organs. This imaging method relies on strong magnetic fields and radio waves to produce high-resolution images that assist physicians in diagnosing various conditions and injuries without the need for surgery. MRI equipment consists of several key components that work together to produce detailed images of the body:[24]

Magnet: The main component is a powerful magnet, typically a superconducting magnet, which creates a strong and uniform magnetic field around the patient.

Gradient Coils: These are smaller magnets inside the main magnet.

Radiofrequency (RF) Coils: These are antenna-like devices that send radio waves into the body and detect the returning signals. There are two types :

Transmit Coils: Send RF pulses to excite the protons.

Receive Coils: Detect the signals emitted by the excited protons as they return to their original state.

Computer System: This processes the signals detected by the RF coils and converts them into images.

Patient Table: The table on which the patient lies during the scan. It moves the patient into the center of the magnetic field where imaging takes place.[25]

Cooling System: The superconducting magnet needs to be cooled to very low temperatures, typically using liquid helium, to maintain its strong magnetic field.

Operator Console: The workstation used by the radiologist or technician to control the MRI machine, adjust imaging parameters, and monitor the process.

3. Methods

This was a descriptive cross-sectional study that evaluated the competency and availability to measure satisfaction with equipment and devices in the radiology department for the practical training of radiology students

The study focused on radiology departments in selected hospitals in Najran that offer practical training programs for radiology students. Radiology students from levels 5-9 were included in the study, While students from levels 3-4 and interns were excluded from the study.

Data was collected through structured questionnaires administered to practical radiology students. Additionally, observations of the training environment and equipment were conducted to evaluate the adequacy of the facilities. In this questionnaire, male and female radiology students were asked 18 questions designed based on their previous clinical training experiences and about their satisfaction with the readiness of the departments in hospitals that contribute to their training, the availability of equipment and techniques required for training, the availability of radiation protection equipment for trainees provided by the university and hospitals, whether the method of use was explained, the quality of the equipment in clarifying images, and the technical status of the equipment along with any issues they encountered, the questions were validated based on previous visits and experiences of radiology students that were on practical training in najran hospitals. Data was analyzed using descriptive statistics, with results presented in tables and graphs by using excel 2013 . The data will be interpreted to assess the competency and efficiency of radiology equipment in the practical training of radiology students. Ethics was considered for this study

4. Results

The chart illustrates the distribution of radiology trainee students based on gender, For Gender Number of males: 28 (29.2%) ,Number of females: 68 (70.8%) It is evident that females constitute the majority of radiology trainees, accounting for more than two-thirds of the total.

Table 4-1: Gender Distribution of Students

Gender	No	Percent
Male	28	29.2%

Female	68	70.8%

The chart and table illustrate the distribution of radiology trainee students across three levels: Levels 5-6 represent a minority, accounting for 9.4% (9 students); Levels 7-8 constitute 20.8% (20 students); and Level 9 represents the majority at 69.8% (67 students). The pie chart visually highlights the dominance of Level 9 compared to the other levels.

Table 4-2: Distribution of Levels of Radiology Trainee Students

Levels	No	Percent
5-6	9	9.4%
7-8	20	20.8%
9	67	69.8%

The students were asked if the radiology devices available in the hospitals visited?

The data presented in the table and chart below represent the distribution of responses regarding the availability of radiology devices in the visited hospitals. The table shows the percentages of collected responses, with (Yes) accounting for 60.4%, (No) at 18.8%, and (Maybe) at 20.8%. The pie chart visually illustrates these percentages, making it easier to understand the distribution of responses.

Table 4-3: distribution of Availability of Radiology Devices

Response	No	Percent
Yes	58	60.4%
No	18	18.8%
Maybe	20	20.8%

Does current equipment meet training needs?

The table and chart below illustrate the distribution of responses to the second question regarding whether the current equipment meets training needs. According to the data, 56.3% of respondents indicated that the equipment meets training needs (Yes), 7.3% stated that it does not (No), and 36.5% were uncertain (Maybe). The pie chart provides a visual representation of this distribution for easier understanding.

Table 4-4: Distribution of equipment meeting training needs

Response	No	Percent
Yes	54	56.3%
No	7	7.3%
Maybe	35	36.5%

Are all device accessories available (shielding, coils, sponges)?

This chart presents the results from a survey regarding the availability of device accessories, specifically shielding, coils, and sponges. The data reveals that a significant majority, 55.2%, of respondents confirmed that these accessories are available. In contrast, only 7.3% indicated that they are not available, while 37.5% expressed uncertainty with a (maybe) response. This distribution highlights a strong perception of availability among participants.

Table 4-5: distribution of Availability of Device Accessories

Response	No	Percent
Yes	53	55.2%

No	7	7.3%
Maybe	36	37.5%

Is radiation protection equipment provided to the trainee?

The chart illustrates the percentage distribution of responses regarding the provision of radiation protection equipment to trainees. The majority, 69.8%, indicated (Yes),confirming the equipment was provided, while 13.6% responded (No),and 16.7% were uncertain (Maybe).

Table 4-6: Distribution of radiation protection equipment provided to the trainees

Response	No	Percent
Yes	67	69.8%
No	13	13.6%
Maybe	16	16.7%

Was the TLD delivered by the university well in advance of the training?

The chart shows the distribution of responses on TLD device delivery by the university (Yes) 58,60.4%,(No) 4 ,4.2%(Maybe) 34 ,35.4%

Most respondents confirmed delivery, with a small percentage saying no, and some uncertain.

Table 4-7: distribution of Delivery of TLD by University

Response	No	Percent
Yes	58	60.4%
No	4	4.2%
Maybe	34	35.4%

Is the TLD device read between training periods by the university and returned at the specified time?

The chart shows the distribution of responses regarding whether TLD devices are read between training periods and returned on time (Yes) 61.5%,(No)9.4 (Maybe) 29.2%

The majority confirmed timely reading and return, while a small percentage said no, and some were unsure.

Table 4-8: Distribution of Tld devices reading between training periods by university

Response	No	Percent
Yes	61	61.5%
No	9	9.4%
Maybe	28	29.2%

Is the available equipment effective in image quality?

The chart illustrates the distribution of responses regarding the effectiveness of available equipment in image quality:Good-Very ,Good 74%,Average 25%,Poor 1% The results indicate that the majority rated the equipment as good to very good, while a smaller portion considered it average, and only a negligible percentage rated it as poor.

Table 4-9: distribution of Effectiveness of Available Equipment in Image Quality

Response	No	Percent

Good - Very Good	71	74%
Average	24	25%
Poor	1	1%

Have you been taught theoretically how to operate devices and equipment?

The chart illustrates the distribution of responses regarding whether theoretical training on operating devices and equipment was provided ,Yes 61%,No 4.2%,Maybe 28.1% ,The results show that the majority confirmed receiving theoretical training, while a small percentage said no, and a notable portion was uncertain.

Table 4-10: distribution of Theoretical Training on Equipment Operation

Response	**No**	**Percent**
Yes	59	61.4%
No	4	4.2%
Maybe	27	28.1%

Is there flexibility and ease in using devices and equipment?

The table and chart present users opinions on the flexibility and ease of using devices and equipment. The results show that 56.3% of participants believe the devices are easy to use, while 5.2% disagree. Meanwhile, 38.5% were uncertain and responded with (maybe), reflecting varied personal experiences

Table 4-11: distribution of Flexibility and Ease of Using Devices and Equipment

Response	**No.**	**Percent**
Yes	54	56.3%
No	5	5.2%
May be	37	38.5%

Did you face any difficulty in training in terms of equipment and devices?

The table and graph below analyze the difficulties that participants encountered during training on using the devices and equipment. The results indicate that 47.9% of participants encountered difficulties, while 17.7% reported no problems. Meanwhile, 34.4% answered (maybe), reflecting the differences in the challenges they faced.

Table 4-12: distribution of Difficulty Faced During Training

Response	**No.**	**Percent**
Yes	46	47.9%
No	17	17.7%
May be	33	34.4%

What is the condition of the existing equipment?

The table shows that 69.8% rated the equipment as good, 26.0% stated it needs maintenance, and 4.2% reported it requires replacement. This indicates that most of the equipment was in good condition, with fewer students reporting a need for maintenance or replacement.

Table 4-13: distribution of Condition of Existing Equipment

Response	**No.**	**Percent**

Good	67	69.8%
Needs maintenance	25	26.0%
Needs replacement	4	4.2%

Do you feel the equipment is safe to use?

The table shows that 65.6% of respondents consider the equipment safe, 32.3% are unsure, and 2.1% feel it is unsafe.

Table 4-14: distribution of Safety of Equipment Usage

Response	**No.**	**Percent**
Yes	63	65.6%
No	2	2.1%
May be	31	32.3%

Have you encountered recurring technical problems with any of the devices?

The table shows that 6.25% of respondents reported recurring technical problems with devices, while 53.1% indicated no such issues, and 6.25% provided other responses.

Table 4-15: distribution of Recurring Technical Problems with Devices

Response	**No.**	**Percent**
Yes	6	6.25%
No	51	53.1%
Other answers	6	6.25%

Do you think there is a need to update current devices to newer technologies?

The table shows that 70.8% of respondents believe there is a need to update current devices to newer technologies, 22.9% are uncertain, and 5.2% disagree.

Table 4-16: distribution of Need for Updating Current Devices

Response	**No.**	**Percent**
Yes	71	47.9%
No	17	17.7%
May be	33	34.4%

How do you evaluate the quality of the image obtained using the available equipment?

The chart illustrates the distribution of responses regarding how participants evaluate the image quality captured using the available equipment:Very Good 51%,Good 47.9%,Poor 1% The results indicate that most participants rated the image quality as very good or good, with only a small percentage rating it as poor.

Table 4-17: distribution of Evaluation of Image Quality Obtained from Available

Response	**No.**	**Percent**
Very good	49	51%
Good	46	47.9%
Poor	1	1%

Has the trainee been shown how to use radiation protection equipment?

The chart illustrates the distribution of responses regarding whether trainees were taught how to use radiation protection equipment Yes 76%,No 10.4%,Maybe 13% The results show that the majority of trainees confirmed receiving training on using the protection equipment, while a smaller percentage reported not receiving training, and some were uncertain.

Table 4-18: distribution of Training on Radiation Protection Equipment Usage

Response	No	Percent
Yes	73	76%
No	10	10.4%
Maybe	13	13%

5. Discussion

This research questionnaire focused on assessing the satisfaction of radiology trainees with the readiness and efficiency of radiology departments in Najran hospitals. Satisfaction levels among trainees are considered a key indicator of the quality of medical education provided. However, few studies have examined this specific aspect table 4-1 states the gender of radiology trainee students

Which includes both genders (29.2%) males and (70.8%) females who's taking radiology practical program to measure their satisfaction with radiology department efficiency. Same outcome by Kyei K. A., Antwi W. K., Bamfo-Quaicoe K., Offei R. O. [26] This study has provided students with the necessary opportunity to reflect and examine issues or concerns on adequate and inadequate orientation to the work place, availability of assistance from staff members and so forth. Students

In table (4-2) shows the different levels of radiology trainee students, the diagnostic radiology major consists of 9 levels not all of 9 levels contain practical program, level 3 to 4 doesn't take practical, so they are excluded from this study however, level from 5-6 levels (9.4%), 7-8 levels (20.8%), 9 level (69.8%) take practical courses and those who can we conduct the survey on them regarding radiology department efficiency in clinical training.

In table (4-3) are all radiology devices available in the hospitals visited?

students who responded with (yes) was 58,60.4% and students responded with (no) was 18, 18.80/0 and students responded with (maybe) was 20 ,20.8% this table Show the most respondents 58 ,60.4% from training students females and males and they agreed on that radiology department were complete on the availability of devices in hospitals they visited however, 18 ,18,8% of training students answered with no showing their unsatisfaction with radiology department and consider it to be inefficient same result as Kyei K. A., Antwi W. K., Bamfo-Quaicoe K., Offei R. O.[26] inadequate resources means that fewer students will benefit from clinical training since the number of students in a particular examination room will far outnumber the equipment available., and 20 ,20.8% of training students answered with maybe and that's could be due to their level and not have been to other modalities.

In table (4-4) does current equipment meet training needs?

54 ,56.3% training students responded with (yes) 7 ,7.3% training students responded with (no), 35 ,36.5% training students responded with maybe.

This statement indicates that most of training students of radiology practical program are satisfied and agreeing on the equipment that are needed and met their training requirements, same result achieved by Kyei K. A., Antwi W. K., BamfoQuaicoe K., Offei R. O.[26] ,ln this study, respondents reported that during clinical training, they were satisfied with meeting their training objectives, enjoyed their time and worked as a team with very willing and available staff that assisted them in learning and this was revealed by 95.2% of the respondents. However, this research showed that not all training settings (supervisors and duty roaster) are available to provide students with a positive learning environment as reported by 38.1% of them.

In Table (4-5), the survey results show that a majority of trainees, 55.2% (53 trainees), are satisfied with the availability of device accessories. 7.3% (7 trainees) responded with "No," and 37.5% (36 trainees) responded with "Maybe." These findings suggest that while more than half of the trainees feel the accessories are sufficiently available, a significant portion remains uncertain. This uncertainty could be due to limited availability of essential accessories or insufficient quantities for each procedure, same result achieved by Kyei K. A., Antwi W. K., Bamfo-Quaicoe K., Offei R. O.[26]

More than half of the respondents are of opinion that x-ray equipments and anatomical markers are inadequate at the department with indications as 52.4% and 42.9% respectively making students too clouded in a single duty room hence training students practically become very difficult, preparing students for entry into the health profession has always been a challenge to undertake. However, majority of the respondents 76.2% reported that cassettes and films were adequate. This revelation is very significant since cassettes are the main raw materials required during the training. Its availability makes clinical training effective and students are able to have adequate experience.

In Table (4-6), the results 69.8% (67 trainees) responded with positively the availability of radiation protection equipment for trainees. 13.6% (13 trainees) responded with dissatisfaction, and 16.7% (16 trainees) responded with "Maybe. "These findings suggest that while most trainees feel they have enough radiation protection tools, some still have concerns. This could be because there isn't enough equipment available or because they haven't received enough training on how to use it correctly, same result achieved by Kyei K. A. , Antwi W. K., Bamfo-Quaicoe K., Offei R. O. [26], respondent (59.6%) is of opinion that no monitoring devices are available for the students and they are too crowded in a room making radiation protection insufficient hence students not too willing to attend training in duty rooms. Clinical training dwells primarily on the availability of resources to make it more efficient and beneficial to the students. Inadequate resources means that fewer students will benefit from clinical training since the number of students in a particular examination room will far outnumber the equipment available. This will also mean that students will spend less time on the equipment and this can adversely affect the quality of clinical training they are receiving.

In Table (4-7), the survey results indicate that 60.4% (58 trainees) agreed that the (TLD) were delivered by the university well in advance of their training. A small minority, 4.2% (4 trainees), responded negatively, and 35.4% (34 trainees) answered with "Maybe." These findings suggest that while the majority are satisfied with the TLD delivery process, A large number of trainees were unsure, which could be due to differences in delivery timing or problems with how the equipment was given to some students, same outcome by Sawsan Ahmed Awadallah A, Samia A. Fathelrahman B, Mohammed Saud Al Harthy C , Nagla Hussein M Khalid D , Bandar Ali S Alshehri[27] shown that most of the respondents were of opinion that X-ray equipment's and Monitoring devices were adequate at the department with indications of 76.6% and 80.5% respectively.

In Table (4-8), responses indicate that 61.5% (59 trainees) believe the TLD device was read during the training periods and returned on time by the university. However, 9.4% (9 trainees) responded "No," and 29.2% (28 trainees) answered with "Maybe." These results imply that while most trainees feel the TLD process was timely, a significant number still have doubts, potentially due to a lack of clear communication regarding the reading and return process or inconsistencies in handling the devices.

In table(4-9):71 trainees responded Good-very good (74%),24 trainees responded average (25%), I trainees responded poor(l %) According to these results, the majority of trainees are content with the image quality that the available equipment produces. A quarter of the respondents, however, believe the quality is only mediocre, indicating that the equipment's functioning or visual clarity may be improved. The extremely low level of dissatisfaction shown by the minimal "Poor" rating suggests that while there may not be many significant problems with the equipment's quality, certain changes could improve overall satisfaction.

in table (4-10),the number of trainees who responded (Yes) was 59,61.4%.Whereas those who responded (No) were 4, 4.2%, and those who answered (Maybe) were 27, 28.1%.According to these findings, most trainees believe they have received sufficient theoretical instruction. But a sizable percentage is still unclear, which can indicate that the theoretical training procedure lacks clarity or consistency. Although the small number of people who said (No)suggests that most trainees possess at least some theoretical understanding, more focus on precise and consistent instruction could.same result achieved by Kyei K. A., Antwi W. K., Bamfo-Quaicoe K., Offei R. O.[26]who identified a gap between theoretical knowledge and practical application in clinical training. Opinions vary on whether classroom teaching aligns with clinical practice. This gap becomes evident during clinical examinations, where students are required to manage cases independently. Often, students rely on practical methods that differ from their theoretical knowledge, leading to poor performance or failure. The text highlights the difficulty students face in connecting the theory emphasized in universities with real-world clinical practices.

In table (4-11),the number of trainees who responded (Yes) was 54,56.3%,while 5,5.2% responded (No), and 37,38.5%,answered (Maybe).According to these findings, more than half of the trainees are at ease using the gadgets' versatility and utility, although a sizeable percentage are still unsure. Variability in device complexity or trainees' varying degrees of familiarity may be the cause of this ambiguity. Although there aren't many obvious problems with the equipment, the low number of "No" answers suggests that improving.

In Table(4-12),the number of trainees who responded (Yes) was 46,47.9%, while (No), and 33,34.4%,answered (Maybe).These findings imply that almost half of the learners encountered equipment difficulties during training, which may point to problems with the availability or operation of the equipment. Furthermore, a significant percentage (34.4%) indicated uncertainty, which can be a result of sporadic difficulties or uneven access to required equipment during training.same result achieved by Kyei K. A., Antwi W. K., Bamfo-Quaicoe K., Offei R. O[26],who identified challenges such as a lack of training equipment, overcrowded training rooms with insufficient supervision, and a gap between theoretical knowledge and practical application. Despite these challenges, most trainees described their clinical training environments as supportive of learning, professional growth, and skill development, reporting overall positive and satisfying experiences. Furthermore, the literature underscores the importance of context in enhancing student learning and satisfaction, emphasizing the value of feedback from all participants.

In Table (4-13), the survey results show that the majority of trainees, 67 trainees,69.8%, feel the equipment available for their training is in good condition. However, 25 trainees,26%,noted that some equipment requires maintenance, while a smaller portion,4 trainees,4.2%, indicated that certain equipment needs replacement. These findings suggest that, although most equipment is functional and meets students' training needs, addressing maintenance requirements and replacing outdated equipment could significantly enhance the academic experience for radiology trainees.

In table (4-14), the results indicate that the majority of trainees,63 trainees,65.6%,believe the equipment is safe to use. However,2 trainees,2.l%,do not feel it is safe, and 31 trainees,32.30/o, answered "Maybe." These findings suggest that, while most students are confident in the equipment's safety, a notable portion remains uncertain. This points to a potential need for improved safety protocols or clearer communication regarding equipment trainees.

In Table (4-15), the results indicate that the majority of trainees,51 trainees,53.I%,have not encountered recurring technical problems with any of the devices. However 6 trainees,6.25%,reported experiencing such issues, while another 6.25% (6 trainees) provided additional feedback. This included difficulties with the devices' inflexibility and a need for updates to improve ease of use. These findings suggest that, while most trainees have a smooth experience with the equipment, a small group still faces technical challenges. This highlights a potential need for regular equipment maintenance and more comprehensive support to address recurring issues.

In Table (4-16)The results indicate that the majority of students, 70.8% (68 students), believe there is a need to update the current devices to newer technologies. However, 5.2% (5 students) do not feel an update is necessary, while 22.9% (22 students) responded with "Maybe." These findings suggest that while most students recognize the importance of upgrading to newer technology, a substantial portion remains unsure. This highlights a potential need for evaluating the effectiveness of current equipment and providing more information on how modern technology could enhance the training experience.

In Table 4-17, the results of the survey showed that the majority of students, 51% (49) indicated that most of the image quality from the available devices is very good and meets the image quality needs required to contribute to diagnosis and treatment. However, 47.9% (46) indicated that the quality of some images is fairly good, while 1% (l) indicated that the image quality is poor. Based on the findings, maintaining regular maintenance, replacement and modernization of equipment will contribute to the ease of obtaining images of the required quality.

Table (4.18): 49 trainees answered yes (51%), 46 trainees answered no (47.9%), and one trainee answered maybe (1%). These results indicate that more than half of the trainees were trained in the use of radiation protection equipment, while part of them were not sufficiently trained in the use of radiation protection equipment, which may lead to misuse of the equipment and increased radiation dose to trainees or patients.

6. Conclusion

Students' evaluation of clinical training using the questionnaire shows us the following: Based on the students' results, they all agreed that there is a problem, which is the large number of students training on one device. Some indicated that there must be coordination with the available hospitals for training to have separate days to divide the students into. Most student trainees agreed that all device accessories are available and that current equipment meets the need. The students agreed that the TLD was given to them by the responsible supervisor at an appropriate period before the training period, and that it would be read after each training period. They also agreed that all the equipment available was effective in photographing quality and that the images were good. Most of the students agreed on the flexibility of the devices and their ease of use, while others disagreed and pointed out that there are some difficulties in some devices, as they close with the recording text or get stuck and do not work.

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