

WORLD RADIOGRAPHY DAY



ISRRT
INTERNATIONAL
SOCIETY OF
RADIOGRAPHERS
& RADIOLOGICAL
TECHNOLOGISTS

WRD 2019 ISRRT SPECIAL EDITION

YOUR SAFETY OUR PRIORITY

The radiographer is promoting
and maintaining safety culture.

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In this Special Edition, articles and reports by authors/societies do not necessarily reflect or represent the opinion and thesis of the ISRRT.



Message from the ISRRRT President

By Donna Newman

Dear ISRRRT Members and Radiography Professional Stakeholders,

World Radiography Day will be celebrated around the world by Radiographers/Radiological Technologists on November 8, 2019. This day has not only become an important time to celebrate our profession, but also to increase public awareness of the vital role diagnostic imaging and radiation therapy play's in healthcare. This year's theme was chosen to raise awareness, help educate and shape the perception on the important role radiographer's/radiologic technologist's play in maintaining safety culture in daily practice. I'm thrilled to share this special addition of World Radiography Day, "Your Safety, Our Priority", the radiographers are promoting and maintaining the safety culture addition with our members and health professionals around the world in hopes that by reading this and incorporating what you learn from our authors you will help drive the ISRRRT key messages of creating, influence and impacting change within your country and daily practice .

ISRRRT collaborated with ISRRRT Member Experts, ISRRRT Member Societies, and Regional Stakeholders to create this special addition highlighting Radiographers/Radiological Technologist's crucial role in helping promote and maintain safety culture. The ISRRRT hopes that this educational material will demonstrate the high educational and professional standards Radiographers/Radiological Technologists live by each day and also help strengthen the safety of patient care and improve the safety culture worldwide.

Technology continues to grow at a fast pace in all our specialty areas of practice. In this addition, ISRRRT member experts share their experience how Radiographers/Radiological Technologists play a pivotal role of safety culture as the corner stone to ensuring Quality Patient Care and Radiation Safety in healthcare. This special edition highlights Safety Culture in daily practice in several of

our specialty areas including Radiography, Computed Tomography, Nuclear Medicine, and Interventional Imaging.

Kathy Cogan, ISRRRT member from New Zealand and Isaak Sugiyanto, ISRRRT member from Indonesia both shared information regarding Safety Culture with emphasis on Computed Tomography. Kathy's article describes how, " Safety in our workplace and in our clinical practice is an inherent part of the Radiographers/Radiological Technologist's role." Isaaks article reflects on how the use of a good standard protocol can be used to improve patient safety."

ISRRRT member's, Edward Chan, Hong Kong, Elizabeth Balogun, Nigeria, Tercia Monette October, Nazlea Behardien Peters, South Africa and Stephen Samson Mkoloma, Tanzania, all cover Safety Culture in general terms with emphasis in the General Radiology Specialty area. Edward Chan, describes how, "image quality, equipment performance and radiation safety are the fundamental duties of radiographers". Elizabeth Balogun explains, the importance of a strong radiation safety culture for reducing doses to as low as reasonably practicable (ALARP)." Tercia Monette October and Nazlea Behardien describe a practical appropriate to improving Safety Culture within your workplace. Stephen Mkoloma describes, " all have a role in Safety Culture political leaders, government, regulatory body and practicing radiographer".

ISRRRT member Roberta Gerasia, Italy shared patient safety in the Interventional Suites with emphasis that " every person, every different profession within the radiology department has a part to play in this aspect."

ISRRRT Past President, Dr Fozy Peer, South Africa explained patient Safety Culture in the Nuclear Medicine, "One of the fundamental management principles for any organisation dealing with radioactive material is establishing a strong

safety and security culture.

ISRRRT member societies also share how their countries National Professional Organizations can help create resources that can be used as guidance tools and standards when trying to improve Safety Culture within their workplace. Member societies have shared their experiences in educational forums, white papers and standards documents. Some of this material is available to the general public to be used as a resource.

The ISRRRT also values their collaboration with their regional partners and stakeholders, specifically the European Federation of Radiographers Societies (EFRS) and the European Society of Radiology (ESR). We want to thank these two organizations for contributing to this year's special addition. The EFRS author, Matteo Migliorini, Italy and Jonathan L. Portelli, Malta shared, " Radiographer's fundamental responsibilities are focused on providing benefit to each and every patient while also aiming to achieving excellence in all aspects of care, safety and patient experience" The ESR article was written by Dr Adrian Brady where he explains, " radiographers carry a large burden of responsibility to protect patients, and discharge that responsibility with great diligence. Furthermore, patients look to radiographers, as the individuals with whom they interact most directly, for guidance, reassurance and professionalism."

Enjoy this issue and the ISRRRT hopes as ISRRRT members and Radiography Stakeholders you will find relevant resources, educational tips and ideas that will help radiographers /radiological technologist influence, impact and create change in your daily workplace within each of your countries. Just think if each of us incorporates one idea from these articles within our daily practice, we will have contributed to elevating safety culture globally. ■



Elizabeth Olasunkanmi Balogun

Academic qualifications

- 2019** PhD-in-view
- 2013** MSC Medical Imaging
- 2012** BSC Radiography (Conversion)
- 1997** Diploma Institute of Radiography (4 Years)

Professional qualifications

- 2017** MBA (Masters in Business Administration) in view
- 2009** PG Certificate in MRI
- 2004** PG Diploma Ultrasonography
- 2002** PG Certificate in Computed Tomography

Honours, distinctions and membership of professional societies

- 2017 Award for recognition by Nigerian Association of Radiography Students (NARS) UNILAG
- 2017 Award for Woman for Merit Gold by PSR
- Member of the Association of Radiographers of Nigeria
- Associate member, International Society of Radiographers and Radiological Technologists

Positions held

- ISRRT Regional coordinator, Professional Practice for Africa 2018-2020)
- President (2016-2019) - Association of Radiographers of Nigeria

email: kanmibalo@yahoo.com

The radiographer is promoting and maintaining safety culture

By Elizabeth Balogun, Nigeria

THE use of radioactive sources in the course of the radiographer's job involves risks due to radiation exposure. Exposure to ionizing radiation occurs in many occupations. Artificial sources of radiation are commonly used in the manufacturing and service industries, in defence industries, in research institutions and universities, and in the nuclear power industry. They are extensively used by physicians and health professionals in diagnosis and in the treatment of diseases. According to the US National Library of Medicine, a practicing radiologist in the United States receives an annual average x-ray dose of 3.2 mSv. This dose of radiation results in between 17 and 28 cancer deaths among the 19,000 radiologists at risk, or an excess cancer risk of between 0.53% and 0.87%. The sub-population of cardiologists and radiologists who perform special procedures is expected to be at a higher risk of death from cancer than the general or therapeutic radiologist. Furthermore, the genetic risk to the children of the radiologist corresponds to a 0.09 to 1.26 excess of cases of genetically-determined disease among the 4047 children in the first generation, or between a 0.02% to 0.31% increase above the expected incidence.

The International Labour Organization estimates that 160 million people across the world suffer from work-related diseases such as musculoskeletal diseases and mental health problems, whereas 270 million fatal and nonfatal work-related accidents result in over 350,000 casualties and over 2 million work-related deaths each year which are all attributable to occupational hazards. A Washington-based study found that, from 1996 to 2000, over 3,300 compensation claims were led due to work-related hazards. More recently, evidence from Sub-Saharan Africa indicates that health care workers are frequently exposed to chemical, biological, physical, and psychosocial occupational hazards. Within radiology, occupational health and safety is an important issue because of high rates of associated morbidity and

mortality of exposed workers. Medical radiation workers are clinical practitioners and are primarily engaged in the use of radiation in the diagnosis and treatment of disease in the radio-diagnostic department. These professionals face often a number of hazards in the workplace.

The importance of a strong radiation safety culture for reducing doses to as low as reasonably practicable (ALARP) and preventing the occurrence of radiation incidents is hard to overstate because good safety culture in an organisation will manifest itself in the conduct of all employees who are striving to adopt safe behaviour and prevent harm to colleagues. Achieving this is a challenging task. The pressures of cost and productivity, essential to the survival of a business or the delivery of high quality healthcare often appear to compete with the desire for high levels of safety. Yet experience shows that far from being in competition, good safety culture, cost effective performance and customer care are complementary. The same priorities and patterns of behaviour inherent in a good safety culture also support high quality operations and productivity.

What then is a Safety Culture?

The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine commitment to, and the style and proficiency of, an organisation's health and safety management. Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety and by the efficacy of preventive measures. Safety culture has two general components. The first is the necessary framework within an organisation and is the responsibility of the management hierarchy. The second is the behaviour and attitude of staff at all levels in responding to and benefiting from the framework, which is where the radiographer comes in.

Key features of a safety culture include:

- Everyone is personally responsible for safety.
- Leaders demonstrate commitment to safety.
- Trust permeates the organisation.
- Decision making reflects safety first.
- A questioning attitude is cultivated including challenge of potentially unsafe acts and decisions at all levels of an organisation without deference to seniority.
- Open reporting of problems and errors, including admission of error without the allocation of blame.
- Organisational learning is embraced.
- Employer involvement at all levels in improving safety and performance.
- Safety undergoes constant examination.

What then is the Role of the Radiographer in Promoting & Maintaining Safety?

• Knowledge Management

Knowledge and understanding of the real radiation risks relative to their benefits are critical. A significant improvement in awareness and technical knowledge would greatly assist the development of a strong safety culture. In fact, the lack of proper understanding of radiation risks by some key players is considered to be a current major hurdle to establishing an effective radiation protection culture. However, the knowledge needs to be matched to the needs of the organisation and the role of each individual within it. Radiographers need to constantly keep their knowledge up to date and teach their colleagues who they work with on new technologies and the safety measures needed.

• Acting as a Radiation Protection Adviser

A key player in developing and embedding a strong workplace radiation protection culture is the Radiation Protection Adviser (some countries refer to this role as the Radiation Protection Expert). However, this is a role that is not well understood in many areas. Amongst radiation protection specialists it is clear that the role is intended to assist the employer to optimise radiological protection and to maintain compliance with the law. However, seen from the perspective of an employer who is under pressure to deliver difficult goals, it can appear that the role is about creating hurdles to getting the job done simply and effectively. In order to succeed in this difficult task, the RPA has to act as

a facilitator and change agent within his or her organisation, working persuasively at all levels from very senior management to the lower ranks. The demands of this role require good communication skills such as persuasive abilities, and many RPAs need help to develop these. It is important that RPAs learn to speak 'the language of senior management' to facilitate communication on radiation protection matters within the upper echelons of the organisation.

• Acting as a Radiation Protection Supervisor

Radiographers can act as Radiation Protection Supervisors who are usually front line supervisors who monitor and strive to maintain the radiological safety of teams working with radiation. The RPS has a crucial role in developing and maintaining a strong radiation protection culture. It is important that support is given to this group by employers and professional bodies to enable the sharing of experience and good practice and to assist the implementation of simple ways to improve radiological safety procedures (and thereby reduce collective dose) without affecting operational delivery.

• The Role of Professional Bodies

Professional bodies such as The Association of Radiographers of Nigeria and other societies should from time to time expose their members to what they can do to reduce radiation dose to themselves, the public and other members of the health care team. Incentives should be given to radiographers who excel in this all-important task.

• Challenges

In some establishments Radiographers are to be seen behind their equipment and not heard but this can be surmounted with good interaction and team work.

Radiographers are usually required to subordinate their own interest to the interest of the employer. Radiation Safety is not only the interest of the Radiographer.

During team work, the other team such as the orthopaedic surgeon are more interested in finishing up their surgeries rather than considering the Radiation dose from the C-arm fluoroscopy machine. The Radiographer should at all time look out for the interest of all even in dispensing Radiation as required but not exceeding the safe dose to the Patient and to the Public. The Radiographer has the custody of the exposure button most of the time.

To dispense or not to dispense lies with justification but optimization and dispensing rightly which is the sole responsibility of the Radiographer should always be appropriately maintained.

Personal/ on the job experiences

As a radiography with an orthopaedic hospital, the need to be deliberate in maintaining safety culture are :

1. Paediatric Radiography

Immobilization to reduce motion blur which also prevent repeat as well as get the cooperation of the patient and the accompany persons. Improvising local and interesting things are usually use as the ideal immobilization kits are not always available. I have had to learn some latest dance steps to help get the attention of the children. Most times give allowance for the children to be properly fed before bringing them into the diagnostic room. A lot of patient and good timing is usually allocated to attend to these children, but it's better than having to repeat and increase the radiation dose to the patient.

2. Use of c-arm during orthopaedic surgery

There is a safety measure on the equipment itself such ability to do pulse rather than continuous fluoroscopy. Therefore, when the surgery time is expected to take long, there is always a deliberate attempt to do pulse rather than continuous fluoroscopy. There is also a time limit ganged to the equipment by shutting down the equipment when the 5 minutes elapses. I usually announce this time to alert the surgeon as there are issues of rebooting the equipment even after it has shut down itself. However, the machine could also shut down due to power failures (A typical challenge in Nigeria) efforts are made to record the time used and the number of exposures , so as not to over-irradiate the patient and other health care team.

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Edward Chan

Edward got his basic radiography training in Hong Kong and Australia and has two Master Degrees in Psychology and Health Care.

He was the Chairman of the Hong Kong Radiographers' Association from 1998-2012 and is currently the Vice-President of Hong Kong College of Radiographers and Radiation Therapists.

He has organised various functions throughout the years, such as continuing education programs & assessments, newsletters, seminars & conferences. Promoting professional development, liaising with local and overseas relevant organisations are his duties of the professional bodies. Standard of Practice and Radiation Protection have become his new focus because of his new position of the organisations and his job nature since 2012.

His daily job is the senior radiographer of the Medical Imaging Department in the University of Hong Kong Shenzhen Hospital, managing over 100 staff including radiographers, nurses and supporting personnel.

email: echanht@yahoo.com.hk

Quality and safety for the patient by radiographers

By Edward Chan, Hong Kong

Introduction

THERE are many professionals in a medical imaging department, such as radiologists, physicist, engineers, nurses and radiographers. Generally speaking, radiographers (radiological technologists) are the first healthcare professional contacting the patient before starting imaging examination).¹ Their understanding of service quality and knowledge of patient safety must be crucial to the outcome of caring and professional performance. It is undeniable that image quality, equipment performance and radiation safety are the fundamental duties of radiographers).^{2,3} However, there are still many quality and safety concerns during the examination process that requires radiographers to observe and manage them. This article will illustrate the issues, analysis tools, possible solutions and recommendations for radiographers to play the leading role of quality and safety for the patient.

Patient safety and quality issues in medical imaging service

Patients have to go through different stages before they can leave the department for their clinical follow-up. Systematically, the medical imaging examination is composed of three stages. They are the pre, mid and post stages of the examination⁴ with each stage should have specific concerns, besides image quality and radiation dose.

Before the examination, radiographers have to prepare the patients when they get the request. There are at least two issues related to safety. First is the justification of the request. Second is the correct identification of the patient and the region of interest. If radiographers failed to address the issues mentioned above, it could increase the unnecessary radiation dose to the patient and cause the misdiagnosis. The optimal waiting time, explanation of the process and acquisition of proper consent from the patients are essential to the service quality. Patient dissatisfaction or medicolegal dispute

could be the consequence of disregarding the needs of the patient.

During the examination, radiographers have to pay full attention to the safety of the patients. The correct protocol, suitable position, and immobilising technique are the absolute responsibilities of radiographers. If the procedure involved using drugs such as contrast media, radiographers should check whether the patient has any contraindication or allergy history with the drugs. Prevention of physical injury is also one of the safety concerns, such as fall and cross infection in the examination room. If the radiographer is working in the MRI, he/she is the only professional to ensure MRI safety. Unsafe MRI practice could cause a catastrophe.

After the examination, the primary concern of service quality is the duty of radiologists; for example, the report turnaround time and quality of the report. They are out of the scope of radiographers' practice. However, radiographers can contribute more at the area of reporting the high-risk incidental finding and protecting the privacy of patients. The high-risk incidental finding report is similar to the red-dot system of image interpretation by radiographers. If a radiographer detected a life-threatening radiological finding on the image, he/she should alert the reporting radiologist to communicate with the referring clinician.

Tools and measures to identify the problem of quality and safety

The areas of concern mentioned in the above paragraphs may not include all quality and safety issues because human is prone to errors.⁵ Therefore, many researchers and institutions recommended various tools and measures to analyse the problem. They are the Radiology Quality Map by Swenson & Johnson,⁶ the Quality Improvement Toolkit by Langley et al.⁷ and the Plan-Do-Check-Act Cycle (Deming Cycle) by Joint Commission International (JCI). The last two options are more comfortable to adopt in the healthcare

setting because they are robust, and we can find an abundance of examples on the internet. For instance, the radiographer in charge may want to identify the reason for a patient misidentification case. The Cause-and-Effect diagram could help to find out the root cause, whether it was insufficient training or skipping workflow. In another case, the CT radiographer would like to study the extravasation of contrast media after high-pressure injection. A histogram could compare the current number of extravasation with the standard practice. As an alternative, those tools and measures are useful for radiographers to develop research topics. By the same token, evidence-based research is necessary before modifying the practice for improvement.

The solutions for Quality & Safety Improvement

Although we know that the cause of quality and safety problem, applying the improvement is a substantial challenge in the clinical setting, especially in a bustling department with a long history of routine. So some driving force should be needed to motivate the personnel of the team to change.⁸ The leading radiographer should explain to the others that the current suboptimal situation could jeopardise their professional images, the reputation of the institute and even their benefit at the end. On the other hand, the workplace should embrace the culture of open disclosure of errors with systemic correction or prevention.^{1,9} For example, a radiographer failed to verify the LMP of a female before an abdominal x-ray. He/she admitted his fault. The supervising radiographer should listen to the colleague and understand the situation of the episode and while the staff has to be held accountable to his mistakes; objective factors should also be considered in the root cause analysis, such as the fatigue of staff and distraction of the workplace. Revising the staffing and working environment could be the solutions. Information technology could be another option to ease the problem.

As a result, those staff friendly policy changes could show that quality and safety improvement is a concerted campaign of the organisation with everyone is getting involved. That is the basic requirement of quality and safety improvement.

Summary and recommendation

Undoubtedly, image quality and radiation safety are the professional subjects of radiographers. Nevertheless, many details of the medical imaging procedure can affect service quality and patient safety, such as waiting time, communication, infection control, the privacy of the patient, MRI safety. Radiographers have the advantage to extend their role of quality and safety improvement in medical imaging service because they are well trained in controlling image quality and radiation safety. Moreover, they understand all the workflow details of the examination. This article cannot include all the quality and safety issues in medical imaging service. Those illustrations are personal experiences and common in medical imaging practice. The reference journal article number 8 and 9 are strongly recommended if the reader would like to have a better concept of quality & safety improvement and analytical tools of medical imaging.

NB: It is my honour to have the opportunity to write an article for ISRRRT Newsletter special edition for the World Radiography Day.

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Kathy Colgan

Kathy is the Charge Medical Radiation Technologist at Rotorua Hospital.

Kathy’s role at Rotorua Hospital includes the daily operational management of the radiology department, staff professional development and the stewardship of student Medical Radiation Technologists, (MRTs). She maintains a clinical role within the diagnostic imaging scope of practice, the majority of which is concentrated on CT scanning which she loves. Kathy finds the clinical role, with patient contact, sharing clinical decision making with colleagues and supporting the critically ill in the wee hours means she never loses touch with the purpose of our profession.

Kathy is the New Zealand Institute of Medical Radiation Technology (NZIMRT) representative on the ISRRT Council having been involved since 2013.

The radiographer is promoting and maintaining a safety culture

By Kathy Colgan, New Zealand

SAFETY in our workplace, and in our clinical practice, is an inherent part of the radiographer’s role and is primarily demonstrated in the act of maintaining our competence. Healthcare does not stand still and this provides a challenge to the practitioner to continue to strive for continued competence and promote and maintain a safety culture.

The single greatest change I have witnessed in my career as a radiographer is the advent and advancement in the technology of the Computed Tomography (CT) Scanner. The ease in which the medical fraternity see the CT scan as answering the clinical question and the timeliness of that answer has led to an exponential increase in referrals with CT increasingly being the first choice for imaging. The result provides one of the greatest challenges for the radiographer as CT also causes the greatest diagnostic radiation dose. Geoffrey D. Rubin, (Radiology Vol 273 No.2 Suppl) when celebrating the impact of CT imaging on the practice of medicine included a paragraph titled “tempering enthusiasm with caution” (S62). He referred to an article in the New England Journal of Medicine (2007) that discussed the numbers of individuals having CT scans and the frequency in which these CT scans were being performed and from that the radiation risk not to just individuals but to the population as a whole. The theoretical ‘cancer risk’ attributed to medical imaging and especially CT scanning led to a change in focus from purely one of image quality to one that took into account radiation dose and patient safety. Today, the requirement for the radiographer, supported by the radiologist to have a ‘gatekeeping’ role ensuring justification of the imaging request and being advocate for the patient in regards to radiation safety has never been greater.

During my radiography training the first Computerised Axial Tomography scanner (CAT Scan) was installed in New Zealand. As a student I had the opportunity to spend a couple of weeks in the CAT Scan

Department. I recall each scan / slice taking approximately 10 seconds and the radiographer had to manually move the bed the 10mm space between each slice. If a breath hold was required the radiographer called the instructions through the microphone for each and every individual 10mm slice. The majority of the work performed was brain scans with some limited chest and abdomen work. Scans were lengthy and radiation dose significant but referrals were typically limited to the most complicated of medical problems. Prior to the CAT scan, neurology imaging required interventional angiography or encephalography both of which involved significant risk and radiation dose to the patient so the new technology provided huge advantages to patient care.

The advancement of this modality was rapid firstly with the advent of slip ring technology enabling the gantry to rotate continuously coupled with continuous table movement. Single slice technology gave way to helical or spiral scanning enabling single body parts to easily be scanned in one breath hold. Interpolation of data allowed reconstruction of images in sagittal and coronal planes and 3 dimensional image production. The modality lost the “A” in its name as it was no longer limited to the production of axial images. Multi Slice CT with the changes in detector materials and configurations, and the rapid ability to receive and manipulate data enabled a whole body scan to be performed in seconds and virtual angiography and colonography to be performed without the risks the conventional procedures involve. In maintaining a radiation safety culture in practice, the first challenge for me as a CT radiographer is to ensure the referrals for CT are justified. The Radiologist is the clinician who ultimately determines if the referral is accepted but my role as the patient advocate is to ensure that the clinical information provided is adequate. I need to be certain that all previous imaging has been reviewed, to alert the Radiologist to any anomalies in the patient history that

have been noted, that patient consent is gained and preparation is adequate. The adage – right test, right time’ still holds true and a CT scan should not be performed if the clinical question can be answered by plain imaging and / or ultrasound. Increasingly clinicians will select a CT scan as first choice imaging due to its ability to answer so many questions. This ability in itself also raises many questions and poses an ethical dilemma for referring medics as to what to do with the incidental findings that bear no relationship to the clinical problem the patient presented with. Ongoing continued follow up of incidental findings, which frequently require sequential imaging, likely CT, further increases patient dose often resulting in no change to patient outcomes.

The ease in which the referrer sees CT as providing the answer has led to the region of interest for the scan continually increase. Trauma scans have become ‘whole body’ scans with requests to perform even before a full clinical survey has been performed by the trauma team. Multi-phase imaging with contrast agents further increases the region of interest as any body part may be scanned multiple times to determine characteristics of blood flow and therefore pathology. For the radiographer to ensure radiation safety is acknowledged in this situation requires a sound knowledge of presenting pathologies, expected imaging appearances, the difference the contrast imaging phase is likely to make to an accurate diagnosis and to share that knowledge with the referrer. A retrospective study performed in Sweden by Linder et al (2016) looked at all of the trauma patients presenting within a set period to a city hospital and a country hospital. Injury scores, imaging and all follow up visits that occurred for a 36 month period following the trauma were reviewed. The study demonstrated that within the low risk group characterised according to mechanism of injury and Injury Severity Scores (ISS) there were no injuries identified on whole body CT. The conclusion from the study was that for young low risk patients that were alert, without intoxication and when clinical evaluation identified only minor injuries whole body CT scans did not improve patient care. The follow up period identified there were no missed injuries.

Radiation safety is not seen as an important factor to many referrers especially in

the acute phase of a patient condition. This places greater emphasis on the radiographer to ensure that optimisation of the radiation dose is achieved. One of the easiest ways in which to optimise dose in CT is the region of interest size. Patient advocacy requires the radiographer to perform imaging that will answer the clinical question with radiation exposure to the smallest region of interest appropriate for the expected pathology. Inherent within the CT scanner are a range of dose reduction technologies, the ability to use different algorithms to enhance pathologies without requiring rescanning, virtual shielding, and spectral imaging among others. Knowledge of national and international dose reference levels and adherence to protocols that meet these standards reduces the risk to the patient and to the population of receiving radiation doses greater than that required to achieve optimal images and successful diagnosis.

The International Choosing Wisely campaign encourages referrers to use clinical decision rules to support referral patterns to ensure benefits of tests outweigh the risks. Clinical evaluation of the patient to determine a differential diagnosis prior to referral for imaging enables studies to be tailored to a stricter region of interest and / or to confirming identification of a specific pathology. The radiographer needs to be aware of and to champion evidenced based clinical guidelines and referral pathways while recognising that there may always be a medical presentation that does not fit the pattern.

CT scanning offers the patient, the clinician and healthcare organisations the ability to provide or support rapid diagnosis, enabling timely management of the patient clinical condition often at significantly reduced costs. The challenge for the future for the radiographer is in recognising this potential and working with the medical profession to ensure that patient selection is based on clinical need – the right test at the right time for the individual patient accompanied by the provision of appropriate clinical information that allows for the diagnostic imaging to be successful. A clinically justified scan must then be performed using the technical capabilities of the CT scanner to ensure dose optimisation and ultimately accurate diagnostic images. Achieving all of this for every individual patient ensures

the risk of the radiation from the CT scan is outweighed by the risk to the individual’s health caused by the medical condition.

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Roberta Gerasia

Roberta graduated from the University of Palermo with a Bachelors degree in Radiography and Radiation Therapy in 2004. Since then she has been working in a transplant center, an institute for scientific-based care and research in the fields of end-stage organ failure treatment and a centre of excellence for the entire Mediterranean area.

Roberta has experience in the field of cardiovascular and hepatobiliary interventional radiology focusing her attention on radiation protection of patients and staff during interventional procedures performed on adult and paediatric patients. She has published works in international scientific journals and regularly presents her work at international meetings.

Her educational credentials include many lectures at professional society conferences in Italy. Furthermore, she is the first, and currently the sole Italian radiographer who has obtained the European Diploma in Radiography.

Roberta is active in the national and local boards of radiographer societies in Italy as board member of the Italian Association of Interventional Radiographers (AITRI), scientific committee member of the Italian Federation of Radiographers Scientific Associations (FASTER) and education delegate for Palermo with the Ordine TSRM PSTRP.

Patient safety in interventional suite

By Roberta Gerasia, Italy

THE simplest definition of patient safety is the prevention of errors and adverse effects to patients associated with health care. Radiology departments have a moral, professional, and legal responsibility to protect the safety of patients receiving imaging studies with ionizing radiation.

Since the term 'safety culture' first emerged in 1988 following the nuclear energy Chernobyl disaster, it has become a commonly used term and has received varying definitions. Safety culture is defined to be "the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management" or "the values shared among organization members about what is important, their beliefs about how things operate in the organisation, and the interaction of these with work unit and organizational structures and systems, which together produce behavioral norms in the organisation that promote safety".

But, what means "patient safety" in interventional radiology? And above all, what it means for interventional radiographers?

A large number of potential risks could be encountered by the patients from their visit to the radiology department including the wrong procedure being performed or studies being performed on the wrong patient or the wrong side of the patient. Importantly, radiation exposure also has risk, including the potential for stochastic effects and tissue reactions especially when interventional radiology procedures are performed.

Radiation exposure through medical imaging has increased significantly in recent decades and, more recently, the number of fluoroscopically guided procedures, which impart high radiation doses to patients, has also substantially increased.

While the benefits of interventional radiology are widely recognised, the risk of x-ray radiation should always be kept in mind when performing procedures in view of the fact that after long and complex procedures, patient dose might exceed the threshold of deterministic effects. Also, stochastic effects can occur even for relatively low doses delivered during interventional procedures.

Patient radiation doses during interventional radiological procedures may be high and it is more relevant especially when pediatric patients are involved. As well known, children are more sensitive to radiation than adults and have a longer life after exposure during which they can manifest the deleterious effects of radiation. In fact, their longer life expectancy allows more time for any harmful effects of radiation to manifest, and developing organs and tissues are more sensitive to the effects of radiation.

Practices have to be optimized in order to reduce these risks. It is therefore mandatory to be aware of the possible radiation doses incurred and to practice dose reduction while maintaining adequate image quality and clinical success.

However optimization doesn't only mean "keep detector close to patient" or "collimate" or "using shielding". The basic aim of optimization of radiological protection is to adjust imaging parameters and institute protective measures such that the required image is obtained with the lowest possible dose of radiation. It also means to adjust technical parameters related to the patient size and to the difficulties that may be encountered during individual procedures together with operator choice of fluoroscopy protocol while maintaining the patients' doses at relatively contained levels and the adequate image characteristics related to the kind of procedure performed and medical device that interventionalist is using. Many studies have shown that the amount of radiation for interventional procedures

is much more affected much more by procedure complexity than by patient size and weight, and fluoroscopy time was considered a procedure complexity surrogate. Nevertheless, more recent papers have demonstrated that fluoroscopy time has minimal correlation with radiation delivered. Radiographer should understand when fine detail is necessary and which factors independently influence image characteristics and patient dose. Need for deeper knowledge (training) and awareness to understand critical steps or to act during emergency procedures, good practice is necessary but not sufficient! Purchasing new equipment without a concomitant effort on education and training and on a program of quality assurance should be dangerous!

New technologies are meant to bring substantial improvement to interventional radiology and can help us to achieve high image quality with a lower patient dose. The newest angiographic equipment are sophisticated and, at the same time, flexible devices. They allows for choosing from different auto exposition trajectory, each one optimized for using different technical parameters basing on an established percentage of dose as threshold and different image characteristic and usually medical physics set up fluoroscopy protocol for standard patients basing only on equipment architecture. So, it might seem very easy to use simply pushing fluoroscopy foot pedal or moving C-arm and nothing else. However, during procedures we can have many different patients and situations and poor knowledge of factors influencing procedures often do not allow for optimal dose reduction.

Finally, angiographic equipment considerable complexity brings opportunities for new types of human error and problems with equipment. Also inattention and lack of unawareness of signs that indicated that "something is going wrong", e.g. conflicting signals, displays or messages, omission of follow-up of equipment malfunctions or false alarms should always be checked and avoid before procedure is started.

Radiographers must be able to understand both procedure and equipment complexity and when something doesn't work correctly! Combining education with interventional radiologist is necessary.

In-depth knowledge of angiographic equipment and equipment specific training allows for varying physical parameters or simply choosing a different trajectory among the pre-set by the manufacturer's one. It can result in a significant patient dose reduction, up to 80%. Furthermore, simulation using phantom tests and research activities have the potential to improve the safety of health care by allowing health care practitioners to acquire valuable experience, in a variety of clinical settings, without putting patients at risk.

Dissemination of information on errors or mistakes is crucial in interventional radiology. In addition, information on circumstances that almost resulted in serious consequences (near misses) is also important, as the same type of events may occur elsewhere. Sharing information about near-misses is thus a complementary important aspect of prevention.

Moreover, awareness and surveillance of the radiation doses imparted to patients in fluoroscopically guided interventions are of paramount importance. So, dose monitoring software represents a valuable tool for improving patient safety also in fluoroscopically guided interventions and for raising dose awareness. This new software automatically registered any radiation dose delivered to patients and provided a cumulative dose history to assess a potential dose accumulation after repetitive radiation exposure. Radiographers should be able to understand dose alerts given from this software providing feedback to the interventionalist and providing entailed dose values for various interventions considering different levels of complexity. Furthermore, it allows for external and internal comparison of dose data as well as dose data collection for a dose registry.

All of these aspects should be obvious to everyone. We need to develop a culture that encourages all staff members to raise concerns regarding practices that place patients at risk, or said a different way, to engage in advocacy activities to keep patients safe. An attitude of learning from experience should be cultivated and communication among staff members may help to reveal weak points in the system before an accident occurs. Also included was the need to develop a culture that encourages all staff members to raise

concerns regarding practices that place patients at risk, or said a different way, to engage in advocacy activities to keep patients safe.

Because every person, every different profession within the radiology department has a part to play in this aspect, close liaison between all staff members is necessary and help us to improve patient safety culture. Radiographers, radiologists, medical physicists, and others need to collaborate to truly foster a culture that protects patient safety.

Radiographers, as well as anyone in the healthcare environment, should always have to be conscious that our practice inherently has risks and must take responsibility for being accountable for patient safety. ■



Fozy Peer

Dr Fozy Peer holds a doctorate in radiography with qualifications in both Diagnostic and Nuclear Medicine. She commissioned both the general Nuclear Medicine and PET-CT departments and currently manages the Nuclear Medicine Department at a tertiary level hospital in South Africa.

She is the immediate past president of the ISRRT. Prior to her presidency she served two terms as Director of PR and Communication on the ISRRT Board of Management and eight years as an ISRRT Council member representing South Africa.

Dr Peer is currently a member of the executive of the Society of Radiographers of South Africa (SORSA) and has held positions of president, national treasurer, nuclear medicine representative and public relations on SORSA.

She was an elected member of the statutory board of Radiographers and Clinical Technologists at the Health Professions Council of South Africa, editor of journals and many publications. She has served as chairperson, lecturer and/or moderator at conferences, supervised masters and doctoral students and examined dissertations.

Passionate about radiographers holding their own and fulfilling their potential as professionals especially with regards to radiation protection issues. She is currently on the interim committee involved with rolling out AFROSAFE – South Africa.

Radiation safety culture in nuclear medicine

By Fozy Peer, South Africa

Introduction

IN keeping with the international World Radiography Day 2019 theme of the ISRRT, the radiographer is promoting and maintaining safety culture, this article is centred on radiation safety culture in nuclear medicine.

Background

Management of patient radiation doses in medical imaging has evolved because concern about radiation exposure has increased in the recent past. The International Commission on Radiological Protection (ICRP), the International Atomic Energy Agency (IAEA), and the World Health Organisation (WHO) respective efforts to reduce radiation dose are based on patient safety employing mainly the fundamentals of optimisation and justification.

One of the fundamental management principles for any organisation dealing with radioactive material is establishing a strong safety and security culture.¹ Patient safety, according to the WHO's report Patient safety - global action on patient safety presented at the 72nd World Health Assembly in March 2019, is "a large and growing global public health challenge".² New treatments, technologies, and care models have therapeutic potential, but they may pose novel threats to safe care. One of the top ten causes of death and disability in the world is probably due to patient harm from adverse events. It is estimated that because of unsafe care, approximately 64 million disability-adjusted life years are lost worldwide.² Risks associated with healthcare are emerging as major challenges for patient safety. They contribute significantly to the burden of harm due to unsafe care, for example, "radiation errors involve overexposure to radiation and cases of wrong-patient and wrong-site identification; a review of 30 years of published data on safety in radiotherapy estimates that the overall incidence of errors is 1500 per 1 million treatment courses."² The effects of unsafe healthcare not only have tragic

consequences for individual patients, but reach much further where a lack of focus on patient safety has major financial implications.

The IAEA defines a strong safety culture as the "assembly of characteristics, attitudes and behaviours in individuals, organisations and institutions which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance".¹ Culture is to society what memory is to individuals. Assumptions about the way people act and perceive themselves and their environment are encompassed in culture. Traditions that reflect what has worked in the past may be included as culture.¹

Radiation safety culture

Where activities are performed with radioactive materials and radiation-producing equipment a positive radiation safety culture should be established and maintained. The responsibility for establishing a radiation safety culture should be shared by all radiation workers and senior management. The role of radiation protection professionals is to promote a positive radiation safety culture in the workplace.

The United States Nuclear Regulatory Commission (NRC) defines nuclear safety culture as "the core values and behaviours resulting from a collective commitment by leaders and individuals to emphasise safety over competing goals to ensure protection of people and the environment".³

Over 30 million nuclear medicine procedures are performed annually: this translates to somewhere in the world a new procedure starts every second.⁴ An increasing number of patients benefit from the exponential rise in nuclear medicine procedures performed around the world. This rise also intensifies the need to avoid any related accidental radiation exposure. "Incidents, including near-misses, happen more frequently

than accidents, and by looking at them and learning from them, we can improve safety.”⁴ Incidents may occur while preparing radiopharmaceuticals, during the management of radioactive materials, and /or while performing a procedure on a patient. These incidents are not limited to patients. Patient caregivers, and health professionals working with these radiopharmaceuticals, also need to adopt a radiation safe culture.

Safety measures

Developing a safety culture in nuclear medicine is a must. As cited by Song⁵, the “United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2008 Report, (UNSCEAR 2008) estimated that 32.7 million global diagnostic nuclear medicine examinations are performed annually, which represents an increase of 0.2 million examinations per year or <1% since the 1991–1996 survey”.⁵ During the period 1997–2007, the annual collective effective dose to the world’s population, due to diagnostic nuclear medicine examinations, rose by approximately 35%. According to the UNSCEAR 2000 report there are two reasons for the increase in the global collective effective dose from diagnostic nuclear medicine examinations. There has been an increase of nearly one third in the average effective dose per procedure which has increased from 4.6 mSv to 6.0 mSv, and the number of diagnostic nuclear medicine examinations performed annually increased.⁵

It is essential to evaluate and discuss what systems need to be in place for each different type of potential incident as the causes may vary. Increased awareness and alertness should lead to unsafe conditions being addressed. The aim of this article is to describe a more global approach to safety culture and hence the details of the specifics around radiation safety culture are not included.

Each nuclear medicine centre should have detailed policies and procedures as pertains to safety culture. In order to strengthen safety culture in nuclear medicine for the prevention of incidents and accidents, timeous and accurate reporting of incidents is necessary. There is a need to develop comprehensive operating procedures, training and understanding, and clearly defined responsibilities.

As radiation protection is an important pillar of safety culture, tools other than optimisation and justification, should include clinical audits, diagnostic reference levels and education.⁶ The establishment of routine clinical audits and dose repositories to support dose management play an important role in radiation safety for both patients and staff. Dose tracking of individual patients will assist with achieving a high level of patient safety.^{6,7}

Justification and dose optimisation are primary elements of radiation protection that should be learned during the training of imaging and therapy professionals. Hence the appropriateness of investigations to answer the clinical question needs to be checked by these individuals prior to embarking on any examination. There needs to be referral guidelines/clinical decision support packages available so as to guide health professionals regarding the appropriate radiological investigate pathway.⁸

Radiation protection training with certification might prove useful as an additional safety measure. Mechanisms need to be in place to ensure that employers and practitioners are licensed for the administration of radioactive substances for specific purposes. Every practitioner should hold a license in order to justify the administration of radioactive substances to humans.

Child protection is an extremely important issue in patient safety. Besides imaging examinations or procedure-specific paediatric considerations, according to the United Nations International Children’s Emergency Fund (UNICEF)⁸, comprehensive national child protection systems must be in place which should apply to all aspects of a child’s life. The Nuclear Medicine Global Initiative (NMGI) objectives include the promotion of human health by advancing the field of nuclear medicine and molecular imaging. They report on the value of paediatric nuclear medicine, the carcinogenic risk of radiation related to radiopharmaceutical administration and dosimetry models in children,^{5,9} standards for administered activities in children and an evaluation of the current practice of paediatric nuclear medicine with regard to administered activities. They recommend global standardisation of the administration

of radiopharmaceuticals in children.⁹ The NMGI suggests that administered activity for paediatric patients be incorporated into audits and that paediatric dose recommendations be incorporated into formal training curricula for nuclear medicine professionals.⁹ There is an onus on all medical imaging professionals to respect and protect children’s rights.⁸

Way forward

Implementing patient safety interventions and monitoring and measuring their impact in the 21st century requires the application of digital technologies.² Digital technology helps support and enhance critical elements of patient safety as healthcare delivery systems become increasingly complex. This will include the reporting of incidents and the analysis of these reports to derive the lessons learned, the monitoring of patient safety interventions, patient and family engagement, organisational learning, and education and training of healthcare professionals.²

Safety culture is multifaceted. A prerequisite for providing people-centred, safe care to populations lies in mainstreaming the multidimensional concept of patient safety culture into healthcare systems.² However, factors such as leadership and governance, communication, teamwork, organisational learning, patient and family engagement and human factors, are essential. The best way to improve patient safety entails several things; interconnection between people, systems and cultures, and focusing on system improvement and learning.² Traits for improving radiation safety culture identified by different organisations, for example the IAEA¹ and the NRC³ include:

- Personal accountability to allow all individuals to take personal responsibility for safety.
- Leadership safety values and actions where leaders demonstrate a commitment to safety in their decisions and behaviours.
- Problem identification and resolution where issues potentially impacting safety are promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance.

- Work processes to ensure the process of planning and controlling work activities is implemented so that safety is maintained.
- Continuous learning so that opportunities to learn about ways to ensure safety are sought out and implemented
- Environment for raising concerns so that a safety conscious work environment is maintained in which personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment or discrimination.
- Timely decision-making to make a positive impact.
- Effective safety communication that maintains a focus on safety.
- A questioning attitude so that individuals avoid complacency and continually challenge existing conditions and activities in order to identify discrepancies that might result in error or inappropriate action.
- Respectful work environment so as to allow trust and respect to permeate the organisation.

A global coordination mechanism should be established to enable countries to implement minimum standards for patient safety. This mandate should cover sharing information based on analysis of major patient safety incidents and subsequent learning, and disseminating patient safety best practices. Global coordinated efforts considering the principles of accountability and cooperation can challenge the burden of unsafe care.²

In order to address patient safety, learning systems and reporting of adverse events need to be established as a matter of priority. The types, extent, causes of errors and near misses and adverse events are essential to derive policies and strategies. To encourage healthcare professionals to report and learn from incidents, the reporting environment must be blame-free and non-punitive. The reporting environment must also allow for patients, their families and caregivers to report on their experiences in a fair and blame-free environment.² In order to estimate the burden of unsafe care, more rigorous studies are required. A prerequisite for the provision of safe care demands a competent and compassionate workforce and effective leadership.²

An indispensable part of clinical training, education and continuous professional development for patient safety is a must for healthcare professionals. Regular audits of near misses and incidents to determine strengths and weaknesses in patient safety policies should be performed routinely. For patient safety to be less prone to human error, standardised procedures need to be adopted in the healthcare system.² Increasing awareness, developing procedures, training and defining responsibilities are paramount in developing safety culture.⁴

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Tercia Monette October

Qualifications:

- B-Tech: Diag. Rad. (CPUT, 2007)
- NDip: Diag. Rad. (CPUT, 1986)

Positions held

- Chief Radiographer, Groote Schuur Hospital, 1987- present.
- Chief radiographer in casualty since 2008. Supervisory experience in trauma, mammography. Experience in general radiography, cath lab and CT scanning.



Nazlea Behardien Peters

Assistant Director: Diagnostic Radiography Groote Schuur Hospital (GSH)

Qualifications

- MSc Diagnostic Radiography (CPUT, 2018)
- B-Tech: Diagnostic (CPUT, 1998)
- B-Tech Education (TUT, 2004)
- NDip: (D)(CPUT, 1993).

Positions held

- Commenced at GSH July 1996 as a junior radiographer, promoted to Chief in 2000 and Assistant Director in 2007.
- Experience in general radiography, trauma & casualty, fluoroscopy, interventional radiography and CT scanning.

ALARA from a different perspective

By Tercia Monette October and Nazlea Behardien Peters, South Africa

At a government practice in the Western Cape the radiographers started 'back to basic' learning sessions within the department. They responded to complaints from staff and discovered practice-related complaints and workflow issues. These were reviewed within the areas and each chief radiographer then designed a simple to do list/task list with practical solutions to the daily issues.

The matters addressed were infection control (as a practice issue), work ethics, and imaging and radiation protection.

Infection control was highlighted as a practice issue

If the radiographer is not well, optimal service provision is not possible and the required duties cannot be performed. So, in practice, a new look at the small achievable steps (listed below) than can create a greater outcome.

- Wear protective gear such as a disposable mask, apron, and gloves where indicated.
- Read the clinical history of the patient. Many patients may have MDR/XDR and a radiographer could become infected if the correct protective barriers are not in place.
- Protect your clothing, as you still need to perform x-rays on other patients and you do not want to be the source to spread infection. Wear gloves to protect your hands if you have open wounds or scratched, all breeding grounds for infection.
- Cover the imaging plate and/or clean the x-ray receptor to avoid cross infection risk.
- Apply handwashing between and after each patient. Maintain a clean work environment clean. This includes all equipment, surfaces and positioning pads. Taking five minutes to clean the equipment and environment will prevent big issue later.

Having proper work ethics

- Treat your patients with dignity and

respect, they are someone's mother, father or grandfather.

- The patient is not well and does not need your rudeness or a bad attitude.
- Address your patient properly.
- Be passionate about your work.
- Produce images of a good quality that you can be proud of.

Imaging and radiation protection

- All patients need to be properly identified. Failure to do so will result in imaging the incorrect patient and a repeat and/or overexposure of the patient.
- Read the clinical history. If you do not do this, then how will you know what views are needed. If the clinical information states possible renal calculus and an abdomen projection is requested, you should avoid using the acute abdomen series protocol (3 views instead of 1). If you do, it means unnecessary radiation dose to the patient. Always determine WHY the images are needed, WHAT views will be required, then HOW will the views be done. If you are unsure of the correct positioning, the result will be repeat images and thus unnecessary radiation dose to a patient.
- Before you expose, ensure optimal patient care, explain the procedure, add an anatomical lead marker, provide shielding, then expose at the correct setting, or you may have to repeat!

Whether we apply ALARA (as we know it) or infection control principles, we are radiographers, and we are passionate and proud of the images we produce. ■

Disclaimer: This is the personal view of the radiographer/s and not of the Society of Radiographers of South Africa or the ISRRRT.



Isaak Sugiyanto

Isaak Sugiyanto is the President of Perhimpunan Radiografer Indonesia or Indonesian Society of Radiographers. He is a Doctoral Candidate in the Faculty of Medicine Diponegoro University, Semarang, Indonesia and a Master of Applied Science (MRI) Royal Melbourne Institute of Technology, Australia.

He has been working as a lecturer since 1989 in the State of Polytechnic of Allied Health, Semarang on undergraduate level and postgraduate program (Master of Applied Science in Diagnostic Imaging) and held the position of Director in that Polytechnic from 2007-2017. His position is now as Head of Center of Health Education of Human Resources, Ministry of Health Republic of Indonesia.

He has been an active participant in regional, national and international forums and conferences from 2007 until now. 2006-2015 he was Chairman of Central Java Provincial Indonesian Society of Radiographers. In 2011-2015 President of Indonesian Association of Radiographers Educational Institution (AIPRI). Since 2011 he has held the position of ISRRT Indonesian council member.

The use of low radiation and iodine dosage techniques for CT new patient safety in diagnostic imaging

By Purwanto Kasbullah and Isaak Sugiyanto, Indonesia

Introduction

PATIENT safety is an important matter in medical care. Errors in medical practice have been a long time issue, and since the past decade has become the object of research with the main goal is to improve safety. It started from the Harvard Practice study, published in 1991, which evaluated 30,000 medical records of patients admitted to hospitals in the State of New York, and found that there were 4% among these patients suffering from drug side effects while being hospitalized (Brennan, Leape et al. 1991). Similar studies in Australia and United Kingdom reported higher incidence of 13% and 10% respectively (Wilson, Runciman et al. 1995).

Institute of Medicine (IOM) in 1999 reported that the death rate due to medical misconduct ranged from 98,000 to 400,000 per year in the United States, which may be prevented if all care-givers applied the rules of patient safety. Further researches had confirmed these findings and showed that the incidences of medical errors in the United States have not changed.

In 2001, IOM published solutions to reduce errors in hospital services in their article titled "Crossing the Quality Chasm: A New Health System for the 21st Century". IOM offers six solutions to improve the quality of health services, which included safety, effectiveness, patient-centered care, timeliness, efficiency and equality (Wolfe 2001). One of the topics, which is patient safety has become reference or initial guide throughout the world, including in Indonesia, to practice patient safety in the treatment process.

The era of patient safety in Indonesia was initiated by the establishment of Patient Safety Committee by the Indonesian Hospital Association, precisely on June 1, 2005 followed by the launch of Patient Safety Movement by the Minister Health of the Republic of Indonesia on August 21,

2005 to implement patient-based services nationally. One year later, training was conducted involving 1900 doctors and nurses from 250 hospitals in Indonesia. In 2006 the National Patient Safety Guide was published. The government along with council members ratified Law No. 44 of 2009, where in article no. 2 mentioned that hospitals are organised based on Pancasila and human values, ethics and professionalism, benefits, justice, equality and anti-discrimination, protection, patients safety, and social functions. This spirit arouses from the solution published by Institute of Medicine (IOM), and in 2012 the Hospital Accreditation Committee (KARS) developed accreditation standards that must be followed by all hospitals with the main philosophy of improving quality and patient safety.

Errors in diagnostic radiological services have been reported frequently for several years. Dr Henry Garland reported a very high level of inaccuracy in results of radiological and other medical examinations (Garland 1949). He specifically mentioned 30% errors occurred in the interpretation of thoracic radiological examination. In the following decades, additional research showed that this level of diagnostic error has not changed substantially (Berlin 2014). However, misperceptions in image interpretation are only one aspect of error in radiology. Errors may occur basically in every step of imaging process. The latest report regarding the error rate in diagnostic radiological examinations included three main areas in terms of patient safety. The first area was identification error, which comprised of wrong patient, wrong radiological examination procedure, wrong side or site. The second was diagnostic errors, which comprised of image perception and interpretation; failure to send, understand, and follow up on medical imaging reports. The third was communication failure, especially at

the time of admission and submission of results (Jones, Thomas et al. 2010)

Patient Safety in Radiology Services

Medical errors have become a challenge for every hospital practitioner, including radiology and diagnostic imaging services. Diagnostic imaging must develop a safe new protocol for several procedures that have high risk potential for patients. One strategy is proactive risk identification to prevent and identify harm and reduce impacts to patients. Continuous efforts to improve quality management focus on standardizing procedures, therefore errors were quickly identified and managed in order to improve and create a safe culture in our radiology unit.

This solution is based on the definition of patient safety where hospitals have to develop a system that protects their patients, including risk assessment, identification and management of issues relating to patient risk, incident reporting and analysis, learning from incidents that had occurred and its management along with implementation of solutions to minimize the occurrence of further risks and injuries. WHO defines patient safety as the freedom of patients from unnecessary potential hazards during treatment (Hurwitz and Sheikh 2009). Safety is one of the main indicators of high service in addition to the quality aspects and management of risk management (Bellamy 2005).

The solution that we are trying to develop to make radiological diagnostic services based on the principle of patient safety and to reduce the negative potential due to radiological examination procedures is to cultivate the use of safe radiological examination procedures. A good standard protocol must be used to improve patient safety. Protocol implementation and selection are based on clinical needs and age groups such as giving the right radiation dose to adult, adolescents or children. One of the main purpose is to improve CT scan examination protocol with contrast using iodine.

Based on the results of risk identification, CT is one of the examination procedures with the highest risk. CT is a diagnostic imaging technique that is necessary for diagnosing anatomical abnormalities of the

body. The benefits of rapid and non-invasive and technical innovation that improves image quality and processing in CT scan, cause increasing demand of this procedure. However, increasing use of CT has become a concern regarding the risks associated with ionizing radiation, especially those related to the emergence of cancer due to ionizing radiation (Sodickson, Baeyens et al. 2009). Overall, radiation exposure from CT scans in Europe accounts for around 60% of the total radiation dose of all radiographic procedures, while the lifetime attributable risk of cancer due to radiation from CT scanning is estimated to be around 0.7%³ to 1.5-2.0% (Regulla and Eder 2005). This condition causes CT scan examinations to be classified into radiological examinations with high risk for patients. Efforts should be made to reduce ionizing radiation exposure that patients received during CT examinations.

Iodine contrast is widely used for CT scan examination with the main indication is to improve contrast of pathological lesions such as tumors, infections, abscesses and vascular abnormalities from healthy tissue. The increasing number of CT examinations has resulted in an increasing use of iodine-based contrast materials. However, this increased used of iodine has the potential risk of causing contrast induced nephropathy/CIN. This has raised concerns in recent years, especially in patients with kidney problems, children, elders and patients suffering from diabetes mellitus (DM) who consume metformin drugs, therefore, we have to search for efforts to reduce the number of doses of contrast media to reduce the occurrence of CIN in patients.

Low CT radiation and low iodine technique

The number of X-ray photons released from the tube depends on the value of the tube voltage (kV), tube current (mA) and exposure time (second), which increases linearly with the value of mAs and the square of two of the tube voltage value (kV²). Tube voltage (kVp) influenced the number of X-ray photons and also determined the amount of X-ray energy. X-ray energy is related to contrast subject values and scattered radiation production. Low tube voltage (kVp) results in increase rate of absorption (absorption) mainly in tissues with high atomic numbers and results in high contrast of the subject, while

in high tube voltage (kVp), the high energy of X-rays cause increasing penetration and results in low subject contrast. The increase in tube voltage (kVp) also results in scattered radiation production due to increased Compton interaction, and these scattered radiation may cause low contrast on subjects and noise.

To reduce exposure values of radiation doses received by patients, CT manufacturers have introduced various automatic dose modulation strategies such as low tube voltage (kVp) and / or tube currents (mA) combined with iterative reconstruction and other approach to decrease doses for image acquisition such as pitch selection. These techniques have been shown to lower the radiation doses on CT examinations. In general, CT examinations use a high voltage (kVp) in the range 120-140 kVp.

With iodine contrast enhanced CT examination, low tube voltage (kV) (80-100 kV) will increase X-ray absorption or attenuation resulting in high contrast on CT images, compared to high kV with the same amount (volume) and concentration of contrast used. Several other studies in various applications have stated this increase in attenuation at low voltage (kV) to emphasise the possibility to reduce the contrast dose of iodine-based media and radiation doses when using protocols with low voltage (kV) parameter selection. Aschof et al (Aschoff, Catalano et al. 2017) concluded that the use of low tube stress (kV) on CT examination using iodine contrast material is very possible to reduce the radiation dose received by patients, while image quality is the signal to noise ratio value (SNR)) can still be maintained. Another study conducted by Nakaura et al (2011) in patients with decreased faltering function using iodine contrast volume reduction, dynamic CT using 80 kV low voltage followed by an increase in mAs value technique can reduce the iodine contrast volume up to 40% the image quality is still good. This result is the basis in our hospital to further develop the technique of using tube voltage (80 kV) and low iodine contrast as an implementation of a new culture of patient safety.

One study that support the use of low voltage (kV) on iodine contrast enhanced CT examination are conducted by Kalva et

al (Kalva, Sahani et al. 2006), where the purpose of their research is to determine the effect of CT parameter selection, including the value of voltage (kV) with mAs value against contrast value to noise ratio (CNR) on the contrast use of iodine and gadolinium. The results showed an increase in the value of HU which was significant for the selection of voltage (kV) of 140 kV compared to the voltage of 80,100 and 120 kV respectively at 62,9%, 39,% and 16,8%. Other study (McNitt-Gray 2002) showed variables related to CT radiation output values, one of which is the voltage selection parameter (kV) in addition to invoicing mAs, pitch, collimation and patient size.

Based on the above results and statement, it is clear that low dose radiation and concentration of iodine may be used in contrast-enhanced CT scan as implementation of patient safety in diagnostic radiology centre. At our workplace, the Radiology Department of Dr. Wahidin Sudirohusodo Makassar Hospital, the low voltage (kV) protocol has become the standard protocol for iodine contrast-enhanced CT scan (80-100 kV) depending on the patient’s size / thickness. While the maximum volume of iodine contrast used for CT examination of the thorax and

TABLE 1. VARIATION IN THE USE OF KVP ON CT SCAN WITH RADIATION DOSE VALUES

	CTDI-VOL BODY CT (MGY)	% CHANGE FROM LOWER KV - BODY
80 KV	3.44	-
100 KV	6.47	88
120 KV	8.45	145
140 KV	12.35	259

abdomen is 50 mL and concentration of 300. Aside from aspects of patient safety, it has another benefit of decreasing cost, while still maintaining the image quality.

The below is an example of the results of examinations in our hospital, CT Scan images with variations in tube voltage values (kV) with the Hounsfield Unit (HU) value produced.

Contrast iodine abdominal CT scan with variations in the value of kVp (80-140 kV) produces HU values in the anatomical area of the different aorta in the arterial phase. In contrast and low rate usage the same, the lower the kVp is used, the higher the value of HU, while the use of high kVp

produces a low HU value. In addition, the use of a low kVp on a CT scan also has the advantage of producing a low radiation dose. As in the table above.

Conclusion

The concept of patient safety has developed significantly over the past decade in all health services including radiology services. Basic patient safety in radiology starts from correct identification of patients, prevention of misinterpretation and good communication. Another important issues in patient safety in radiology services is risk management. Radiology have to classify the source of risk that are exposed to patients. Contrast enhanced CT scan is classified as high



Figure: Patient, 65-year-old female, CT abdominal scan with contrast arterial phase, 50ml total volume contrast. Flow rate 3 ml / sec in the aorta produces a value of 396.5 HU at 80 kVp (A) and (B) patient, 65-year-old woman, CT abdominal scan with contrast arterial phase, total volume contrast and flow rate equal to the aorta resulting in a value of 268.3 HU.

risk procedure in the radiology service because of the risk of exposure to excessive radiation and contrast induced nephropathy (CIN). The choice of voltage (kVp) and the low amount of iodine on CT examination is one of the efforts to improve towards the new safety culture in the radiology service.

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ASRT



A CULTURE of safety is part of the DNA of the world's largest radiologic science association. The organisation's commitment to safety is a core value clearly stated in the ASRT Mission: The mission of the American Society of Radiologic Technologists is to advance and elevate the medical imaging and radiation therapy profession and to enhance the quality and safety of patient care.

Several programs and practices define the ASRT's commitment to safety

The **ASRT Practice Standards for Medical Imaging and Radiation Therapy** define the practice and highlight patient safety measures for medical imaging and radiation therapy professionals.

The **ASRT Curricula** outlines a common body of knowledge that codifies and standardizes the core content for radiologic science educational programs in the United States. The guidelines ensure that all entry-level and advanced radiographers and radiation therapists are educated in key patient safety principles, as well as in techniques that protect themselves from strain and injury including body mechanics, patient transfer and ergonomic principles.

The ASRT is a founding member of the **Image Wisely** and **Image Gently** campaigns, which provide educational resources for medical imaging professionals, patients and parents. Both programs encourage radiologic science professionals to optimize the amount of radiation used in medically necessary imaging studies and eliminate unnecessary procedures.

ASRT has published an **MRI Safety White Paper** as a definitive guide to radiologic technologist best practices for MR safety.

The **ASRT Safety First** grant in collaboration with Canon Medical Systems supports radiologic technology workplace safety initiatives with two grants of up to \$7,000 each. Grant funding has been used to purchase lightweight, lead-free aprons and an MRI-safe cart for patient transfer, among other safety solutions.

- ASRT Practice Standards for Medical Imaging and Radiation Therapy
www.asrt.org/main/standards-and-regulations/professional-practice/practice-standards
- ASRT Curricula
www.asrt.org/educator/asrt-curricula
- Image Wisely
www.imagewisely.org/about-us
- Image Gently
www.imagegently.org/about-us/the-alliance
- MRI Safety White Paper
https://www.asrt.org/docs/default-source/research/whitepapers/asrt18_mrsafetywhitepaper.pdf?sfvrsn=ca0222d0_10
- ASRT Safety First grant
<https://foundation.asrt.org/what-we-do/safety-first> ■

Donna Long

This article was written by Mrs Donna long, on behalf of the ASRT.

Bulgaria



(BALODT) unites the X-ray technicians and specialists, working in the field of imaging diagnostics and all fields using ionizing radiation in medicine. It also contributes to their professional development and improvement. BALODT contributes for introducing, dissemination, implementation and development of contemporary approaches in the field of radiology and imaging diagnostics, nuclear medicine, radiotherapy, radiobiology, radiation protection and contributes to development of scientific researches in the field of the mentioned specialties in Bulgaria.

During the past year BALODT carried two training courses related to refreshment and improvement of the knowledge and skills quality of the practicing X-ray technicians on topics concerning patient safety. On the 23-th of March 2019, in Sofia a training course on "Prevention, organisation and control of nosocomial infections" was carried. It aimed to acquaint the attendees with nosocomial infections, which disinfectants and disinfection methods to use. In the practical part, each participant had the

opportunity to disinfect his/her own hands /by his/her own way and by the rules/, afterwards to check the result of disinfection by apparatus.

The training course, held in Varna on July 27, 2019, on the theme: "Contemporary view on the introduction and implementation of contrast substances in the imaging diagnostics", aimed to acquaint the audience with the options for contrast agent dosing in a CT examination. Choosing the proper quality of contrast agent leads to a less radiation load and protects patient from contrast induced nephropathy. The practical part was organised for three groups and every participant had the opportunity to practice his/her skills in working with Injector and Web based patient-oriented program for contrast agent.

In future, training events in the field of radiation protection, communication, information for the patient and etc. are forthcoming within the framework of congresses, scientific conferences and postgraduate training courses. ■

Denmark



MR safety

THE Danish Council of Radiographers has the recent couple of years had a certain focus on MR-safety. To work with the problem politically, we have contacted the responsible Minister of Health, suggesting following the International Guidelines on the subject. There is an ongoing process, that has been delayed a little by a national election, and after that a change of government and ministers.

This April we hosted a conference within The Danish Parliament, Christiansborg. The conference had international participation, e.g. Doctor Emanuel Kanal, but the target was of national observance at MR-safety.

Radiation Protection

The Danish Council of Radiographers cooperates about Law of Radiation protection with Danish National Health Authorities and the Radiation Protection Officers (RPO)

July 1, 2019 Denmark got a new Legislation of

Radiation Protection complying to the EU-guidelines. The Danish Council of Radiographers has cooperated with the Danish National Health Authorities and from 2020 we will arrange a yearly conference for Radiation Protection Officers in Denmark in cooperation with the authorities.

"Folkemødet" the Peoples Meeting

Each year, the Danish island Bornholm is hosting "Folkemødet" – The People's Meeting (A gathering of NGO's, politicians – both locals and MP's – and, not the least, citizens). For the last 9 years, The Danish Council of Radiographers has made an effort to inform both people and politicians about radiation and safety. We have had various subjects, happenings and debates through the year with divided intensity. But at least, we are hosting in an "Information Stand", where people and politicians can go and ask questions related to radiation. That has been, and will be, an ongoing event every year. ■

Claus Brix

Ghana



SAFETY culture is an organisational perception that places an importance on safety, values and attitudes, and these are shared by the majority of people within the workplace. It can however be characterised as 'the way we do things around here'. A positive safety culture can result in increased productivity, health and safety.

Understanding what influences the culture of radiography practice can make a significant contribution to changing the attitudes and behaviors of radiographers in relation to workplace health and safety.

Safety is play a pivotal role in quality of healthcare processes. Patients and Radiographers safety is very core to radiography considering the energy used and the robustness of the various equipment. The principles of justification, optimisation, ALARA among others all point to promoting and maintaining safety. Safety can only be ensured, when people know what to do to avoid hazardous situations. Radiographers are therefore given the requisite knowledge to ensure that their actions lead to safe practices.

As a way of empowering our esteem radiographers, the leadership of the Ghana Society of Radiographers teamed up with other imaging related groups to host the 2019 edition (10th Biennial Congress) of the Pan African Congress of Radiology and Imaging (PACORI). The theme was "Achieving the health-related SDGs in Africa: the role of Radiology and Imaging". The conference was attended by imaging professionals all over Africa, United Kingdom and the United States of America. We shared ideas on the need to show

professionalism in service delivery to ensure quality healthcare for all our patients irrespective of their background.

Upgrade of academic knowledge is also key in quality healthcare delivery. The Society has spearheaded the implementation of flexible academic programs such as Sandwich for holders of Diploma, part time and full time Master of Philosophy and Doctor of Philosophy in Medical Imaging in collaboration with various Universities in Ghana. Members are now able to pursue higher education in Ghana without the need to travel outside the Country. These measures, we believe will empower our members to deliver quality services to our patients.

The Society has also been at the forefront of fighting against quackery in the profession. This has been possible through the joint effort of the Allied Health Professions Council and other stakeholders in the imaging fraternity in Ghana. By this, we have ensured that only qualified personnel deliver imaging services to our patients even though the struggle is still on going.

Finally, as a way of helping our nation achieve the SDG 3.8, the Society for the first time coordinated the posting of interns Radiographers to orphaned facilities and Senior Radiographers are designated to supervise them. This is to ensure that people in the rural areas also get access to quality imaging services. ■

Prince Rockson

Indonesia



THE development of the hospital as a health care facility has been very rapid in recent years, both in terms of the number and utilization of medical technology. The law states that the hospital as a health care facility must still strive for Occupational Safety and Health for all hospital workers. Occupational Health and Safety efforts must be carried out to realise optimal work productivity in all workplaces, especially places that have health hazards, are easily contracted by disease or have many employees. In line with that, the hospital is included in the criteria of the workplace with various potential hazards that can have health impacts such as potential radiation hazards. One medical service at the hospital is radiology.

Hospitals have the potential for accidents and work-related illnesses, especially radiology installations because they use ionizing radiation and people who operate the radiation source. Radiographers have the duties and responsibilities to perform patient service to patients, radiodiagnostic services and radiotherapy, guarantee the implementation of services and results of work, carry out radiation protection work, conduct radiological quality assurance.

Radiology utilizes X-rays for the purposes of diagnosis both diagnostic radiology and interventional radiology. X-rays are a type of ionizing radiation that can provide benefits and also exposure to radiation can damage or alter cells and tissues and even death.

The radiation beam interaction with the cells of the human body will cause various chemical reactions. This is known as somatic / non-somatic effects and² genetic / stochastic effects. If the amount of radiation energy absorbed or received (dose) exceeds the threshold (Threshold Limit Value) determining effect can occur. At lower levels of radiation can cause mucositis. The effect of X-rays can cause haemopoietic damage (blood disorders) such as: anemia, leukemia, and leukopeni which is a decrease in the number of leukocytes (below normal or <6000m3).

In adult humans, leukocytes can be found in about 7,000 cells per microliter. White blood (leukocytes) is the cellular component of blood that is the fastest to change due to radiation.

Given the potential for large radiation hazards in the use of X-rays, safety factors are important so that they can minimize the risk of work in radiological installations and the impact of radiation on radiation workers.

To prevent this, it can be done by applying radiation safety management aspects where radiation safety is an action taken to protect patients, workers and community members from the dangers of radiation. Based on the Indonesian Government Regulation

on Safety of Ionizing Radiation and Security of Radioactive Sources, any person or entity that will utilize nuclear power such as energy originating from ionizing radiation sources must have permission to use nuclear power and fulfill 4 radiation safety requirements. Radiation safety requirements include:

1. management requirements;
2. radiation protection requirements;
3. technical requirements; and
4. safety verification that aims to achieve the safety of workers and community members.

INSAG-4 defines a safety culture as a combination of characteristics and attitudes in organizations and individuals who determine that safety programs are a top priority and get attention according to their interests.

Safety culture is an abstract concept but has an important role in determining the safety of workers and the work environment where there are radiation sources and patients. Radiographers must have and apply a work safety culture while serving with radiation.

Government regulations regarding radiation safety include:

- Government Regulation No. 33 of 2007 concerning Safety of Ionizing Radiation and Security of Radioactive Sources as a control effort.
- Decree of the Head of the Nuclear Energy Supervisory Agency (Bapeten) number 01 / Ka-Bapeten / V / 99 concerning Work Provisions for Radiation which contains a dose limit value, namely radiographers <50mSv / year and the general public <5 mSv/year.
- The collaboration of all components in the radiology unit includes the head of the installation, specialist doctors, radiology, nurses and administration.
- Management's commitment in providing PPE and inspection aids, safety equipment, supervision, making policies, regulations and procedures that can be understood and implemented by all radiographers. The leadership and management commitment significantly influences the realization of a safety culture. Management commitment is the main factor in the form of actions, policies, writings, or verbally.
- The existence of written work safety regulations and procedures and understood by all parties. The discussion is easy to understand and easy.
- The existence of written work safety regulations and procedures and understood by all parties. The discussion is easy to understand and easy to implement, there are sanctions.
- Communication, competence and involvement of the radiographer. Effective communication can minimize the risk of workplace accidents.

Work environment, facilities and infrastructure. A comfortable work environment provides a feeling of security.

- Safety behaviors include discipline and compliance in using PPE, conducting periodic health checks and radiation dose checks.

Radiographers must always be reminded, motivated, and take care of each other. Radiographers have to provide safety standard Lead Apron for patients and families, Always check TLD results, Use a mask to avoid nosocomials, and Periodic health checks every year during work, to find out medical history. Health checks include Anamnesis, physical examination, chest x-ray and complete blood laboratory, also Chromosomes and sperm analysis if a radiation accident. Radiographer has to learn about radiation doses, improve knowledge with authorised institutions such as Batan and Bapeten. The application of a radiographer's safety culture supported by a safety management system includes top management commitments, safety, communication, competency regulations, radiographers' involvement, a safe and comfortable work environment.

Radiation used in radiology is also useful to help diagnose it, it can also cause danger to radiation workers and the general public who are around the radiation source.

The amount of radiation hazard is determined by the amount of radiation, the distance from the source of radiation, and the presence or absence of radiation protection. Efforts to protect radiation workers and the general public from the threat of radiation hazards can be done by:

1. Designing a radiation room in such a way that radiation exposure does not exceed the limits that are considered safe.
2. Completing each radiation room with appropriate radiation protection equipment in sufficient quantities.
3. Equip each radiation worker with a radiation monitor.
4. Use radiation apparatus that meet radiation safety requirements.
5. Make and implement procedures that work with radiation that are good and safe.

1. Design and exposure in the radiation room

a. Radiation Room Size

- The minimum size of the room for x-ray radiation is 4 meters long, 3 meters wide, 2.8 meters high.
- The size does not include the operator's room and patient dressing room.

b. Wall Thickness

- The thickness of the wall of an x-ray room is such

that the absorption of radiation is equivalent to the absorption of radiation from lead of 2mm thick.

- Thick walls made of concrete with a density of 2.35 gr/cc are 15cm.
- Thick walls made of brick with plaster are 25cm.

c. Doors and Windows

- Doors and holes in the wall (eg socket outlets, etc.) must be provided with radiation resistors which are equivalent to 2mm lead. At the door of the radiation room there must be a red light that lights up when the apparatus's control table is turned on. The purpose is: To distinguish rooms that have radiation hazard exposure with rooms that do not have radiation hazard exposure. As a warning indicator for other people besides medical personnel not to enter the room because there is a radiation hazard in the room. As an indicator that in the room there is an x-ray plane being active. It is expected that the X-ray examination room is always tightly closed to prevent the danger of radiation exposure to other people around the X-ray examination room. The window in the radiation room is located at least 2 meters from the outside floor. If there is a window that is located less than 2 meters, it must be given a radiation barrier equal to 2mm lead and the window must be closed when the radiation is in progress. The observer window in the operator's room must be given a radiation retaining glass at least equivalent to 2mm lead.

Radiation Exposure

- The amount of radiation exposure that is still considered safe in the radiation room and the surrounding area depends on the user of the room.
- For the room used by radiation workers the amount of exposure is 100 mR / week.
- For rooms used by other than radiation workers the amount of exposure is 10 mR / week.

2. Radiation Protection Equipment

a. Radiation Protection Clothing (APRON)

Each radiation room is provided with radiation protection clothing in sufficient quantities and a thickness equivalent to 0.35mm lead.

b. Lead gloves

Each conventional fluoroscopy room must be provided with lead gloves.

3. Radiation monitor

a. Film Badge/Thermo-luminescence Dosimeter (TLD)

Every radiation worker and / or other worker who has to work around the radiation field because of his field of work must wear a badge film every time he starts his work every day. Film badges are worn on work clothes in areas that are thought to receive the most radiation or in areas that are considered to represent the reception of doses

throughout the body such as the front chest or front pelvis.

b. Survey meter

In a radiology unit a survey meter must be provided that can be used to measure radiation exposure in the room and measure radiation leakage.

4. Radiation Apparatus and modalities

a. Tube leakage

X-ray tube (tube) must be able to withstand radiation so that radiation that penetrates does not exceed 100 mR per hour at a distance of 1 meter from the focus on maximum stress.

b. Filter

The radiation filter must be installed on each x-ray tube.

c. Radiation beam diaphragm

- The radiation beam diaphragm on an apparatus must function properly.
- The minimum diaphragm thickness is equivalent to 2mm lead.
- The position of the diaphragm beam must coincide with the radiation beam.

d. Fluoroscopy equipment

- The fluoroscopic screen must contain lead glass with a thickness equivalent to 2mm lead for x-ray apparatus with a maximum capacity of 100 KV or 2.5 mm lead for x-ray apparatus with a maximum capacity of 150 KV.
- Lead rubber which is hung on the side of the fluoroscopy screen must have a thickness equivalent to 0.5 lead with a size of 45 x 45cm.
- X-ray tube with a fluoroscopic screen must be permanently connected with an automatic socket must be installed to prevent the operation of the apparatus if the center of the radiation beam does not fall right in the middle of the fluoroscopic screen. All fluoroscopic equipment must be equipped with a timer button that gives a warning with a sound after the exposure time has exceeded. The illumination will end if the timer is not reset within one minute.

5. Health Screening

Every radiation worker must undergo a health checkup at least once a year.

6. Calibration of X-ray Planes

X-ray apparatus must be calibrated periodically especially to ensure the appointment of numbers according to the actual situation.

7. Radiation Dosage received by radiation workers

- The highest dose allowed to be received by a radiation worker is based on the accumulated dose formula: $D = 5(N - 18)$ braks
D: The highest dose permitted by a radiation worker during his working period
N: The age of the radiation worker in question is stated in year
18: The minimum age for someone who is permitted to work in the radiation field is expressed in years. The highest number of receipts for the average radiation dose for a year is 5 braks.

- The highest number of receipts for the average dose of a radiation worker within 13 weeks is 1.25 braks. Whereas for pregnant women 1 braks.
- The highest number of receipts for the average dose of a radiation worker within one week is 0.1 braks.

8. Extra Food

The hospital is obliged to provide extra-pudding food that is nutritious for radiation workers to increase the body's resistance to radiation.

9. Working Procedure in the Radiation Room

1. Turn on the red light above the entrance of the examination room.
2. Direct beam should not be about other people than the patient being examined.
3. When the irradiation takes place, all those who are not interested are outside the examination room, while the officers are in the operator's room. Except for using fluoroscopy, the officers wear radiation protection clothing.
4. The time of inspection must be made as small as possible according to needs.
5. Do not turn on the fluoroscopy when there is a change in cassette.
6. Avoid repetition of photos.
7. If necessary, the patient has a gonad shield.
8. The size of the beam must be limited to the diaphragm so that the patient does not receive radiation more than is needed.
9. If the film or patient needs support or assistance, use support or mechanical assistance wherever possible. If someone is still needed to help the patient or hold a film during radiation, he must wear radiation protection clothing and lead gloves and avoid direct beam by standing next to the main beam.

10. Radiological examination should not be done without a doctor's request.

11. Work Procedure in the ICU using Mobile Unit X-Ray

1. Direct beam must not be about other people besides the patient being examined.
2. During radiation, all officers must be as far away from the patient as possible and wear radiation protection clothing.
3. The inspection time must be made as small as possible according to needs.
4. Avoid repetition of photos.
5. If necessary, the patient has a gonad shield.
6. The size of the beam must be limited to the diaphragm so that the patient does not receive radiation more than is needed.
7. If the film or patient needs support or assistance, use support or mechanical assistance wherever possible. If someone is still needed to help the patient or hold a film during radiation, he must wear radiation protection clothing and lead gloves and avoid direct beam by standing next to the main beam. ■

Putu Adi Susanta and Isaak Sugiyanto, Indonesia

New Zealand



PRACTICE in radiography and radiation therapy in New Zealand is highly regulated. The New Zealand Radiation Safety Act 2016 replaced the previous Radiation Protection Act 1965 and its regulations. The titles of radiographer, radiation technologist and medical radiation technologists are protected titles under legislation. All practitioners must be registered and require an annual practising certificate. All training institutions require approval and ongoing monitoring. All x-ray facilities and radiation therapy departments are audited for practice and radiation safety biannually and all entities require annual quality assurance checks to be performed by a qualified Health Physicist.

In such an environment the role for the NZIMRT in supporting and promoting a safety culture is focused on providing ongoing education opportunities and continuing professional development. This is provided through annual conferences, study days, modality

specific workshops and online learning support. A safety culture includes not only radiation aspects, but also occupational safety/ injury prevention, patient safety, and promotion of the Health and Disability Code of Rights. This code ensures that all patients' access to Health care is appropriate to need and provided in a manner which observes the individual human rights of respect, privacy, dignity and care to an appropriate standard.

The NZIMRT also supports the promotion and maintenance of a safety culture by representing the MRT and RT perspective at health work force meeting and various Ministry workshops ensuring the clinical voice is heard. ■

Kathy Colgan

This article was written by Mrs Kathy Colgan, on behalf of the NZIMRT.

Sri Lanka



RADIATION protection is the science and art of protecting people and the environment from the harmful effects of ionising radiation. The objective of radiation protection is to define how one can protect individuals, their descendants and the human race against the potential risks of ionising radiation. The radiographers are the people authorized to use the x-ray producing system or gamma sources for diagnosis and therapeutic purposes. The activities of radiographers are directed towards minimising radiation exposure of patients and personnel during x-ray exposure.

Fundamental principles of radiation protection are justification, optimisation and limitation. Based on the understanding of these fundamental principles, the radiographers make sure that only an individual(s) who should derive maximum benefits from such exposures to ionising radiation (justification) should be exposed. They make sure that radiation doses as result of medical exposures are only enough to achieve needed diagnoses (optimisation). They try to reduce the time of exposure to sources of ionising radiation as short as possible. In achieving this, they have to make use of immobilisers, positioning aids, beam size (x-ray field) limiting devices, and maintain the x-ray machines and radiotherapy equipment in good working condition.

Furthermore, they have to make sure the availability of installed radiation protection instruments such as area radiation monitors, air borne contamination monitors and personnel exit monitors; and portable instruments such survey meters, lead rubber shields

and personnel dosimeters for staff and work place monitoring. In addition, radiation protection measures also include periodic quality assurance checks on the x-ray machine(s).

The radiographers are responsible for ensuring that:

- All rules, regulations, and procedures for the safe use of the X-ray system are followed.
- An accurate record of the use of the system is maintained.
- All safety problems with the system are reported to the Radiation Protection Officer and corrected before further use.
- The system is protected from unauthorised access or removal.

In Sri Lanka the Society of Radiological Technologists is vigilant in this aspect. The society has taken steps to upgrade the knowledge of and improve the practices of radiation protection by the radiographers. Periodical seminars, workshops are organised in different parts of the country. Special programs are launched on the World radiography day every year to increase the public awareness on the radiation hazards and the importance of radiation protection.

Recently I carried out a survey on the use of radiation dose reduction measures in CT and it was found that the level of practice is inadequate. The society is going to organise a workshop to enhance the practice of dose reduction measures in CT. ■

V.G.Wimalasena

Tanzania



KEEPING our environment safe from harm expected from radiation and radioactive material is a collective responsibility of the society. Safety culture needs radiographers and all radiation workers to fully commit themselves into making sure that people we serve, environment and ourselves are away from possible danger of radiation. Safety culture demands large scope of pioneers such as political leaders, government, regulatory body and practicing radiographer making sure that the purpose of the protection of our community and of the environment is established where by the risks associated with ionizing radiation are assessed and controlled without excessively limiting the quality of diagnosis and treatment intended.

The government and regulatory body (in this case the Medical Radiology and Imaging Professionals Council-MRIPC; and Tanzania Atomic Energy Commission-TAEC) must ensure that policy and regulations that govern the course of radiation safety are in place and enforced, and that there is a close supervision to radiographer making sure that radiation safety is observed at all times. Also, it is my experience that employers' trust that radiographers can do best in radiation quality assurance is minimum which degrade radiographers' motivation to performance in the said area. Trust between management and a radiographer are crucial if we want to achieve, establish and improve radiation protection. The fundamental radiation safety culture must start with the top management in the institution while radiographers are trusted for its planning and implementation. Management at all levels must believe in the process of cultural change and be prepared to lead. Variation and an unenthusiastic approach will very quickly weaken the efforts of the radiation workers. Radiation workers and functional managers are central figures in setting local priorities and standards, so failure to engage this level of management fully will disrupt the process. Direct involvement of the radiographers working with local change agents (radiation safety officers) is crucial. Looking out for colleagues practicing unsafe behaviour often requires constructive challenge and therefore a great deal of sensitivity, mutual trust and confidence is highly needed.

The majority of hospitals in Tanzania had for many years been using very old x-ray machines where there is a chance that the optimum tube capacity had deteriorated. This may contribute to inconsistent dose against exposure set selected. Tanzania has limited number of biomedical engineers and having only five medical physicists; where three of them are based in one

hospital. It is so difficult to maintain quality control and quality assurance programs to all facilities in Tanzania, thus majority of facilities operate without knowledge of how efficient and safe the radiation is used. In connection to that, lack of quality assurance equipments and trainings is a setback to maintenance of safety use of radiation in our settings. Hospitals rely only on TAEC supervision reports which happens once per annum or more.

Recently, Tanzania has experienced advances in radiology equipment where most of the old conventional x-ray machines are replaced with digital systems (both CR and DR). This invention of new digital system has reduced the amount of exposure that some hospitals were using before. The exposure factors observed for CXR (not published) in five hospitals are illustrated in the table below.

Based on the above data, there is a great improvement in terms of selection of exposure with less chance of causing harm that analogy era. Post processing capacity in digitized radiography have led some (in potential number) to ignore important techniques as they can manoeuvre the final product sent to radiologist by cropping all unwanted area that a exposed. There is a doubt that, despite the decrease of radiation exposure, there is a risk of increasing patient radiation dose. Radiographers must maintain the culture of collimation of the beam during positioning so to concentrate only on the area of interest. Below is the image of a ten year old male chest x-ray taken from one of the hospitals in Tanzania (name reserved);

The image left represents many of digital images produced by radiographers, but the images are processed and cropped before they are sent to radiologists for reporting. Despite the fact that the final image will represent great technique, majority of our patients suffers the unnecessary radiation.

Due to this, Tanzania Association of Radiographers, in this year's World Radiography Day and Annual Conference is intending to concentrate with the seminars in quality assurance and dose optimization

Comparison of Exposure Technique between Analogy (Conventional) X-ray System and Digital System

HOSPITALS	EXPOSURE FACTORS			
	kV (Analogy)	mAs (Analogy)	kV (CR/DR)	mAs (CR/DR)
A	80	12	90	2
B	80	8	90	2.5
C	90	6	90	1.2
D	120	6	120	0.8
E	70	101	10	16

in digital radiography as a way of reminding radiographers to rethink our technique, our culture of producing quality images with as low radiation dose as possibly achievable. We also urge the school of radiography to motivate students to adopt the safety culture from their trainings.

Knowledge and understanding of the radiation risks in relation to their benefits are significant. Radiation awareness and technical knowledge would significantly support the development of a sustainable safety culture. In fact, the lack of proper understanding of radiation risks by some key players in hospital (especially the management) is considered to be a current main stumbling block to establishing an effective radiation safety culture. However, the knowledge needs to be matched to the needs of the organisation and the role of each individual within it. Different levels in an organization need different type of knowledge compared to a radiographer. Key roles involved must be identified so as every player participate in creating safety culture, the knowledge requirements for each role, and how that knowledge can be effectively imparted.

To attain radiation safety minded generation, there are some key features of a strong safety culture that must be adopted, some of these feature are;

- Every radiographer must be an ambassador for radiation safety
- Leaders and employers must show loyalty to

radiation safety

- All administrative strategies concerning involvement of radiation based activity must reflect radiation safety first.
- A questioning attitude is created, including challenge of potentially unsafe acts and decisions at all levels in course of achieving a radiation based procedures.
- Open reporting of problems and errors, including admission of error without the allocation of blame
- A day by day learning culture is embraced and maintained.
- Employer-radiographer participation at all levels in improving radiation safety and performance.
- Constant and continuous quality control programs
- Good working habit and precise mental setting
- And, usually, think what if it is "YOU".

A Way Forward

TARA (Local representative of the ISRRRT) is committed to the task of assisting all radiographers (Members and Non Members) to develop and implement an effective radiation safety culture in the workplace. It will continue to link Tanzania radiographers with international program especially those organised by ISRRRT, from which useful radiation safety knowledge will be sought so to add value to our work. Radiographers are urged to develop an action plan to achieve this intention of implementing a culture of safety first mentality at all times. Employers are also urged to show interest in supporting this target by providing 'culture improvement tools' such as:

- Training lectures—on radiation protection awareness, change management and cultural development.
- Funding radiographers who are interested with the area of radiation safety and radiation protected to further their studies through short term or long term learning.
- Supporting universities in terms of knowledge and infrastructure that support enhancement of the area concerning radiation safety.
- Clear radiation safety guideline be in place at work places.
- Radiographer motivational events to make them happy with implementation of the culture. ■

Stephen Samson Mkolom
ISRRRT Council Member





Adrian Brady

Adrian Brady is a Consultant Radiologist in The Mercy University Hospital, in Cork, Ireland, and a Clinical Senior Lecturer at University College Cork.

He graduated in medicine from University College Dublin in 1984. After pursuing specialty training in internal medicine, he began training as a radiologist in Dublin in 1987. In 1991, he moved to Canada for further training in gastrointestinal and abdominal imaging and intervention, at McMaster University Medical Centre, in Hamilton, Ontario.

He worked as a staff radiologist in the Wellesley Hospital, Toronto, and Assistant Professor at the University of Toronto from 1992 to 1995, returning to Ireland in 1995 to take up his current position, where he works as a general and interventional radiologist.

Dr Brady has served in many leadership positions within Ireland and Europe, serving as Dean of the Faculty of Radiologists, RCSI (the equivalent of President of the National society & head of national radiology training) from 2010 to 2012.

He has been chair of the ESR Quality, Safety & Standards Committee & member of the ESR executive Council since 2017.

Your safety our priority: The radiographer is promoting and maintaining safety culture

"Someone saved my life tonight" (Elton John, 1975)

By Adrian Brady, Ireland

Many years ago, a radiographer with whom I was working saved a patient from potential serious harm, and, coincidentally, may have also saved my career at the same time. We were performing a barium enema, on a remote-control fluoroscopy table. I moved the joystick to position the patient slightly Trendelburg (head-down). Just then, a colleague came into the room to ask me about another patient. I turned to answer him, forgetting that I was still pushing the joystick, and still progressively increasing the patient's head-down tilt. A shouted warning from the radiographer (who fortunately was by the patient's head) alerted me to the danger, just as the patient started to slide off the table towards the ground. Fortunately, the radiographer stopped the slide, caught the patient, and averted potential serious injury. From that experience, I learnt:

1. Careful attention to even mundane tasks is necessary when patient welfare is at stake
2. Maintaining patient safety is a collaborative effort on the part of everyone involved in their care
3. I'm easily distracted.

Prior to starting a summer job as a watersports instructor this year, my son was obliged to do a day's safety training; he described it as the "Don't kill kids" day. If you ask many of our non-radiology co-workers about what are the key patient safety issues in radiology, most will mention contrast reactions. Some of the more-enlightened may think of radiation dose, and a few may mention radiology

report accuracy. These are certainly central concerns, but patient safety goes far beyond these "Don't kill patients" headings. With this in mind, in 2018 the European Society of Radiology (ESR) and the European Federation of Radiographer Societies (EFRS) undertook to produce a joint paper on patient safety, outlining many of the obvious and less-evident ways in which patient safety could be compromised or enhanced by their interactions with radiology services.^{1,2} Many radiographers and radiologists contributed, with input also from the ESR Patient Advisory Group (PAG). Among the elements of patient safety addressed were:

1. Radiation protection, including justification and optimization of exposures, diagnostic reference levels and management of dose incidents
2. Drug and contrast issues, including hypersensitivity reactions, nephrotoxicity, impact of iodinated contrast on diabetes and thyroid disease, brain deposition of Gadolinium, and cannulation issues
3. Patient handling (including protection of staff from consequences of inappropriate handling)
4. Informed consent and provision of explanatory information to patients, including legal issues, advocacy, patient capacity and risk/benefit communication
5. MRI safety
6. Infection prevention and decontamination
7. Data security and other IT issues
8. Ensuring that radiology services are

- provided by appropriately-trained and qualified professionals
9. Interventional radiological procedures, including patient preparation, drug use, monitoring and complications
 10. Protection of children and other vulnerable persons, including early recognition of signs of abuse
 11. Communication, between patients and staff, and among staff members
 12. The need to continually strive for quality improvement (including continuing professional development, clinical audit, risk management and other allied efforts)
 13. Staff fatigue and burnout, and how they may negatively affect patients

We do not claim that the topics covered in our joint paper are a complete and comprehensive review of all potential patient safety issues. We didn't seek to be exhaustive. Rather, our intention was to demonstrate just how widely the patient safety net should be cast, and in how many ways our professional actions could impact on patients' welfare.

Patient safety is not the exclusive responsibility of any single individual or professional group in healthcare; rather it is a continuing mandate for everybody who comes in contact with patients, in all the complexity and variation of our interactions. Patients are inherently vulnerable when they are in a hospital or clinic setting, including in radiology departments. Aside from physical frailty and limitations, they may also be frightened, worried about the implications for them and their families of their illness or investigations, and intimidated by the unfamiliar surroundings and complex machinery. All of us involved in patient care must be conscious at all times of our obligations to do everything we can to put patients at ease, and above all, to protect them from harm.

In most countries, radiographers have more contact with patients in radiology departments than others involved in the diagnostic process. Nurses and radiologists will have some direct contact with some patients, but radiographers are members of the profession that sees virtually every patient attending a radiology department. As such, radiographers carry a large burden of responsibility to protect patients, and discharge that responsibility with great

diligence. Furthermore, patients look to radiographers, as the individuals with whom they interact most directly, for guidance, reassurance and professionalism. What happens afterwards (reporting of studies, communication of results to referrers, consultations etc.) is vital to patient care, but is rarely seen directly by the patient, and is therefore often poorly understood by the public. Patients meet radiographers face-to-face, they rely on them, and they are protected (in all the wide range of patient safety areas) by them.

It is very fitting that the theme of World Radiography Day 2019 should be patient safety and the role of the radiographer. The ESR is very happy to support World Radiography Day, and to salute our radiographer colleagues for your great, vital work.

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This article was written by Adrian Brady, on behalf of the ESR.



Matteo Migliorini

University Teaching Hospital "Sant' Anna", city of Ferrara, Italy.

- Post Graduated Executive Master Degree in Risk Management and Patient Safety.
- European Federation of Radiographer Societies (EFRS) Expert Network – Patient Safety.
- Risk Management and Patient Safety National Leader Network of Italian Radiographers National Federation, Technical Health, Rehabilitation and Prevention Professions (FNO TSRM PSTRP).
- Working in Healthcare System since 2000, with 10 years deeply involved in Risk Management and Patient Safety.



Jonathan L. Portelli

Lecturer, Department of Radiography, Faculty of Health Sciences, University of Malta.

He qualified as a diagnostic radiographer in 2004 and has been involved in radiography education in Malta for a decade. This year he obtained a PhD from University College Dublin, after conducting a mixed-methods research study that explored radiation dose awareness, benefit-risk communication and consent practices for paediatric imaging examinations. He is a past president of the Maltese Society of Medical Radiographers.



Effective communication by radiographers: at the heart of patient safety

By Matteo Migliorini, Italy and Jonathan L. Portelli, Malta

Introduction

RADIOGRAPHERS' fundamental responsibilities are focussed on providing benefit to each and every patient while also aiming to achieving excellence in all aspects of care, safety and patient experience.¹ Indeed, there is no doubt that every day, thousands of radiographers have an essential role in ensuring optimal, safe and efficient high quality care to millions of patients attending for various diagnostic, interventional and radiotherapy procedures worldwide.

Patient safety, as defined by the WHO, refers to "the absence of preventable harm to a patient during the process of health care and reduction of risk of unnecessary harm associated with health care to an acceptable minimum.² Within the context of radiography, patient safety includes all efforts focussed on "reducing the incidence of unnecessary disease, injuries, adverse events and deaths caused to patients through the delivery of therapeutic or diagnostic procedures"³, including but not limited to all efforts focused on ensuring safety from potential adverse effects of radiation, magnetic fields and administered contrast media.

In actual fact, we believe that the concept of patient safety actually extends beyond the safeguards of patients' physical well-being. It fact, it needs to also consider the welfare of the general public, other professionals and workers, including that of the radiographers themselves. In addition, patient safety also necessitates due attention to everyone's psychological welfare. This point has been echoed in the recently published ESR-EFRS joint paper that emphasised "Fundamental to

all applications of radiological techniques is the requirement that all possible efforts should be made to ensure patients are no worse off after their interaction with radiographers and radiologists than before".¹ This highlights the importance of radiographers being provided with sufficient time within their daily work to be able to support the needs of their patients as well as those of other relevant professionals. In this regard, it is also important that the wellbeing of the medical imaging and radiotherapy workforce is also considered and supported. This is crucial for professionals to be able to achieve excellence in value-based patient-centred care and efficient safe service delivery. Well-being strategies led by senior managers help support this philosophy and are important.

This is why effective communication truly lies at the heart of patient safety. In actual fact, evidence indicates that good effective communication amongst professionals and improved dialogues with patients result in safer work environments, decreased adverse events, as well as increased patient trust, confidence and satisfaction.^{4,5} Therefore, however short the interaction, the goal should always be to invest time to communicate and engage in a dialogue with every patient. This is beneficial as it will help gain patients' confidence, trust and satisfaction while also enhancing their safety as well as those of others. This explains why effective communication skills are considered as core elements of radiographers' education and training.⁶ Indeed, such communication skills are essential for radiographers to be able to deliver the high quality care they strive for. It is in this context that the subsequent

sections have been included, so as to outline some tips and strategies that may further support radiographers in achieving excellence in patient care and safety within their daily practices.

The importance of communication in supporting safe, high quality service provision for patients

Communication refers to the act of transferring information from one place, person or group to another. Such information can be transferred verbally, though body language and nonverbal cues as well as in written form. The way and manner by which communication occurs, is usually influenced though systems, processes and culture.

The very basic process of communication entails that a sender sends a message and a receiver getting that message and providing feedback. Often, however, there is a failure somewhere within the communication between the sender and receiver.⁷ The message may not be delivered or received correctly; it may be miscommunicated or even misread, especially when communicated via non-verbal cues. In healthcare, such a communication failure can lead to serious and rather costly consequences.⁷ Indeed, poor healthcare communication may lead to negative outcomes that not only compromise patient safety but which can also cause death.⁸ It has actually been estimated that poor communication has cost the U.S. healthcare system \$1.7 billion in malpractice costs and 1,744 lives between 2009 and 2013 alone.⁹ Indeed, approximately one third of the 23,000 cases analysed involved a communication breakdown somewhere along the healthcare spectrum. Similarly, medical error has been identified as the third leading cause of death in the US,¹⁰ with most causes of death arising from the 'preventable arms' due to defects in 'Human Factors', 'Leadership', and 'Communication'.^{11,12}

Such factors thereby greatly impact the culture of safety within an organisation. Indeed, a safety culture is dependent on every single interaction and conversation that occurs within the healthcare setting, whereby it comprises individual and team values, attitudes, competencies, and behaviors. Collectively these factors should

form a strong foundation upon which a learning system is built. A learning system is characterised by its ability to encourage self-reflection and the identification of strengths and defects, both in real-time and in periodic review intervals. Radiography managers and professional leads have an important role here in highlighting the importance of continuous reflection so as to assess performance. It entails consistently performing agreed upon team behaviors like briefings and debriefings where the self-reflection occurs. Learning systems identify defects and act on them; they reward proactivity rather than reactivity. Learning and a safety culture reinforce one another by identifying and resolving clinical, cultural, and operational defects.

Effective communication strategies and tips for improved patient safety

Effective communication is fundamental for all aspects of safety, service quality and improved patient experience. In line with the principles of patient centred-care, effective communication is primarily about showing each patient that they are truly being cared for. This is demonstrated through the time invested to engage in a dialogue with the patient; the information provided and tailored according to individual needs and preferences; the ability to listen, note concerns and empathise; as well as the efforts demonstrated to encourage patient involvement and participation in their healthcare decisions. It is in this context that attention to the following five Cs can help ensure effective communication as well as enhanced care and safety in practice.

A large number of patients attend imaging services across a variety of settings. The time of each investigation is often very short and therefore it is essential that communication skills are well developed to enable the best possible interactions with patients within a busy service. This is important because each radiographer-patient interaction will either leave a positive or less positive impact on the patient's overall safety and experience. As appropriately outlined in the ESR-EFRS joint paper focusing on patient safety in medical imaging,¹ we would like to highlight the importance of radiographers being attentive to communicating relevant information in a clear and understandable manner

before, during and after each patient's diagnostic or interventional procedure and/or radiotherapy treatment, as will be further explained in the next sections.

Essential communication before imaging examination

- **Communication with the referrer**
It is essential that all the relevant information about the patient's clinical history and the clinical question is available. This information is required so as to ensure the adequacy or validity of an imaging request that involves ionising radiation and may provide useful for the appropriate planning and optimisation of the procedure. Indeed, the practitioner, be it the radiographer or the radiologist (as specified in relevant legislation in different countries), has the clinical responsibility to ensure that each medical exposure is clinically justified and that it will result in a net benefit for each individual patient.¹³ Additionally, details relating to the patient's clinical history and reason for exam are also important as such information needs to be communicated to the patient, as the latter would need to understand the expected benefits and possible risks when consenting for the relevant investigation or treatment.¹ Furthermore, such clinical history would also influence and determine the adequate dietary advice and preparatory information that needs to be conveyed as necessary.
- **Communication with the patient – Greetings, introductions and performing an ID check**
It is important to ensure that any medical imaging examination or treatment is only performed on the right patient at the right time. Examining the wrong patient could lead to unnecessary exposure to ionising radiation; an unnecessary intervention; a misdiagnosis or other type of harm. In order to ensure safe and best practice, the following steps should be followed by all radiographers imaging patients:
 - Greet the patient, introduce yourself and your role in their care/treatment
 - Ask the patient to state their full name, date of birth, address and/or identification number (when available);
 - For any inpatient, including those transferred from inpatient wards, always

- double check the name stated against the patient ID wrist band and never assume this.
- In line with departmental or institutional procedures, consult with relevant professionals, carers or relatives whenever you encounter a situation whereby it is not possible to confirm a patient's identity BEFORE proceeding with any diagnostic, interventional imaging examination or radiotherapy treatment.
 - **Communication with the patient – Explain purpose, benefits and risks**
The latest BSS Council Directive 59/2013/Euratom specifies that practitioners are responsible to provide patients or their representatives with adequate information about the benefits and risks associated with each medical exposure prior to this taking place.¹³ This responsibility ties in with healthcare professionals' duty to provide patient centred care and involve the patient in decision pertaining to their own health. In this regard, radiographers should always ensure that they:
 - Invest time to seek patients' clinical history so as to re-confirm the region of interest and the reason for requested imaging examination.
 - Inform patients about the purpose of the proposed medical imaging examination, through the use of simple words.
 - Explain the expected benefits.
 - Explain and give some perspective to associated risks, including those relating to NOT undergoing imaging and/or radiotherapy.
 - Continuously observe and be attentive to patients' emotions, stopping whenever necessary, so as to listen to and address any questions, concerns or fears expressed.
 - Check patients' understanding of any instructions or information given, offering supportive written information and follow-up when possible and necessary.
 - Encourage patients' opinions and thoughts so as to allow shared management decision.
 - Respect the patient's autonomy, needs and preferences at all times, even when these differ to professional opinion.

Essential communication during and after imaging examination

- It is essential that there are protocols and procedures in place to support service delivery so as to ensure consistency in practice and the information provided.
- All professionals involved in the medical imaging examination are to communicate and cooperate effectively so as to keep all risks as low as possible, thereby optimising everyone's safety.
- Post-procedure information, including details pertaining to possible adverse effects, any recommended after care, as well as when and where results should be expected, are to be communicated to the patient and/or representative, as well as the carer, referrer and/or any other professionals who will be providing the patient with immediate care the patient.
- Post procedure multidisciplinary meetings are encouraged so as to reflect upon and discuss different cases and procedures so as to further enhance practice and safety

Communication of critical information and the importance of teamwork

Effective communication is necessary to ensure that healthcare delivery is managed well and continuously improves. To facilitate meaningful improvement, the road to healthcare transformation must be paved with good communication, vertically from the top down and the bottom up, and horizontally across the continuum of care delivery.¹⁴ This is particularly essential when critical information needs to be communicated between different professionals, both within the same departments as well as those from other departments and/or hospitals. Indeed, apart from having well written protocols

and procedures that ensure clarity and consistency about the different care pathways, it is equally important that different professionals become cohesive and effective teams who work together and support each other to provide optimal care and safety.¹⁵

As an example, there should be protocols and procedures in place that allow for the proper identification of patients who require additional precaution or care. Additionally, since patients often move between areas of diagnosis, treatment and care on a regular basis, they are likely to experience different members of staff working different shifts each day. Since this change of personnel may pose additional safety risks, it is of utmost importance that the information communicated about a patient during a handover of a patient or a shift is both comprehensive and efficient. This is vital as the information communicated and handed over ultimately influences the delivery of care to patients in the subsequent shift. Similarly, it is essential that professionals are encouraged to reflect and learn from past incidents and errors, especially those linked to a breakdown of communication, so as to bring about a culture of continuous service improvement. In this regard, ongoing CPD and higher level communication skills can also help support safe service delivery.

In this context, we would like to highlight recommendations for health professionals to make use of the SBAR (Situation, Background, Assessment and Recommendation) communication tool when they provide handover information or else need to pass on critical information to other professionals. Indeed, SBAR is an easy to use structured communication

SBAR communication tool to handover critical information

Situation - What is going on with the patient or the situation? For an emergency patient, ask what the presenting complaint is. For an inpatient, ask what the current concern is.

Background - What is the clinical background or context? What is the relevant past medical story or what has happened during this inpatient admission?

Assessment - What do I think the problem is? Ask for the current set of observations and relevant clinical findings.

Recommendation - What would I do to correct it? What needs to be done now? Are there any outstanding jobs? How urgent is it?

tool that enables information to be transferred accurately between individuals within an organisation. In fact, SBAR has successfully been used in healthcare settings allowing for rapid, assertive and effective communication between health professionals, ultimately leading to improved patient safety.^{16,17}

Alternatively, read back/call back is another structured communication tool that may be used to reconcile the transmission and reception of information. This tool encourages the person hearing the message to read back what he or she has heard, which is then subsequently verified or corrected by the person who had provided the original information. This method therefore seeks to prevent miscommunication and encourage accuracy of the information exchanged.¹⁸

Conclusion

There is a strong body of evidence to emphasise why good effective communication skills are essential to ensure the safe delivery of value-based, patient-centred care. Indeed, apart from those already cited in this article, there are many other studies which linked improved communication to better patient outcomes and safer work environments. For this reason, it is of utmost importance that all educational institutions and professional associations do their utmost to ensure that radiographers of today and tomorrow undergo specific education and training that allows for the development of the core communication skills and competencies outlined in the EFRS EQF benchmark document. Similarly, it is essential that ongoing CPD is provided so as to further encourage continuous learning and reflection on practice in order to support continuous service improvement in relation to communication and safety.

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