COLLABORATION IS STRENGTH

In May each year, Member States, NGOs and representatives from other UN agencies attend the World Health Assembly (WHA) in Geneva. In this year’s WHA, four Member States and nine NGOs, in cooperation with the WHO Secretariat organized a side event entitled: “Imaging for Saving Kids - the Inside Story about Patient Safety in Paediatric Radiology”. This newsletter starts with an account of this successful collaboration.

For over three decades, the American College of Radiology (ACR) has worked on a range of quality and safety activities, in keeping with their motto “Quality is Our Image”. In 2004, the Royal Australian and New Zealand College of Radiologists (RANZCR) started a national Quality Use of Diagnostic Imaging (QUDI) Program (currently named Quality and Safety QuaS Program).

The momentum and focus on improvements in radiological quality and safety has increased enormously in the last decade, leading to the development and implementation of campaigns and actions in different regions involving many stakeholders. Examples of these include the: International Radiology Quality Network (IRQN) in 2002; Sun Valley Think Tank in 2005; Image Gently in 2007; WHO Global Initiative on Radiation Safety in Healthcare Settings in 2008; Image Wisely in 2009; Japan Network for Research and Information on Medical Exposures (j-RIME) in 2010; Korean Alliance for Radiation Safety and Culture in Medicine (KARSM) in 2011; International Conference on Radiation Protection in Medicine (Bonn) in 2012; First Global Summit on Radiological Quality and Safety in 2013; International Commission on Radiological Quality and Safety (ICRQS) in 2014; EuroSafe Imaging in 2014 and AFROSAFE in 2015.

Previous newsletters provided an account of some of these activities. In this edition, there are articles featuring the work of the ACR, Image Wisely, j-RIME, and RANZCR. The AFROSAFE declaration and strategic objectives are outlined following its launch on 17th February in Kenya during the 8th Scientific Congress of Pan African Congress of Radiology and Imaging (PACORI).

Procedure justification is one of the pillars of radiation protection. There are two articles about this important topic: 1) history and future developments of referral guidelines and 2) practitioner training to facilitate guideline implementation in the United Arab Emirates. The IAEA provided two articles about radiation protection of patients and the “Tracking of Radiation Exposure of Patients” project.

Based on these quality and safety initiatives, two common elements emerged which underpinned their success: effective stakeholder engagement and collaboration. There is little doubt that “Collaboration is strength” and its liberal use would enhance the outcome of actions undertaken by a team of stakeholders.

Thank you for your interest in and support to “Quality News”. We wish you success in your efforts along this journey of on-going quality improvement.

Lawrence Lau
Editor, Quality News
Chair, International Commission on Radiological Quality and Safety
QUALITY NEWS

Imaging for Saving Kids - the Inside Story about Patient Safety in Paediatric Radiology

The World Health Assembly (WHA) is the supreme decision-making body of the World Health Organisation (WHO) and is held annually in Geneva. The Assembly is attended by delegations from the 194 WHO Member States, the NGOs in Official Relations and representatives from other UN agencies (Fig. 1).

As an NGO in Official Relations with the WHO, the International Society of Radiology (ISR) collaborated with the WHO, 4 Member States and 8 NGOs (Fig. 2) in a side event during this year’s WHA. “Imaging for Saving Kids - the Inside Story about Patient Safety in Paediatric Radiology” was held on 26th May 2015 at the United Nations Office at Geneva (UNOG), housed in the Palais des Nations.

This event brought policymakers, health care providers, equipment manufacturers and patients together to jointly discuss what can be done to improve health and service delivery by maximizing the benefits and minimizing the risks when using medical imaging in children and how this can be achieved.

Universal health coverage aims to ensure that all people obtain the health services they need without suffering from financial hardship. This outcome requires efficient health systems, suitable health financing approaches, access to essential medicines and technologies, and sufficient capacity of well-trained and motivated health workers.

Figure 1: A WHA Plenary Session being conducted in the Assembly Hall of the Palais des Nations.

Figure 2: The side event was jointly organized by the Governments of Kenya, Malaysia, Spain, and Uganda together with the following NGOs in Official Relations with the WHO: Diagnostic Imaging, Healthcare IT and Radiation Therapy Trade Association (DITTA), International Commission on Non-ionizing Radiation Protection (ICNIRP), International Commission on Radiological Protection (ICRP), International Organisation for Medical Physics (IOMP), International Society of Radiology (ISR), International Society of Radiographers and Radiological Technologists (ISRRT), RAD-AID International, World Federation for Ultrasound in Medicine and Biology (WFUMB), and World Organisation of National Colleges, Academies and Academic Associations of General Practitioners / Family Physicians (WONCA).
Medical imaging enables earlier diagnosis and offers less invasive treatment for sick children. Timely access to basic life-saving procedures, e.g., ultrasound and computed tomography (CT) is important. While resources vary between regions and settings, the stakeholders are improving access to these imaging procedures.

Children are more sensitive to ionizing radiation-related health risks, e.g., x-ray exposure during CT scans. Whenever appropriate, imaging without ionizing radiation is used, e.g., ultrasound or magnetic resonance imaging (MRI). Good communication with patients and carers facilitates informed decision-making and minimizes procedure delay or refusal due to unfounded concerns. Every procedure should be justified, tailored, and optimized.

Improvement in patient safety in paediatric radiology requires multidisciplinary teamwork, collaboration and an integrated framework for actions including research, advocacy, education, infrastructure, and evidence-informed policy. These actions will help to improve the performance of practitioners, facilities, and healthcare systems. Some examples include: implementing the International Basic Safety Standards (BSS) through national regulations; putting into practice the ten priorities identified in the Bonn Call-for-Action; taking into account the ICRP recommendations on radiation protection in medicine; increasing access to imaging procedures; improving appropriate use of paediatric imaging by implementing effective policies, providing guidance and tools, and ensuring practitioner education and training; and promoting awareness of stakeholders’ roles and responsibilities.

During the session, the participating stakeholders provided the perspectives of health professionals, patients, families, and health authorities (Fig. 3). The current situation in different regions, priorities, and improvement opportunities were discussed.

It is important to foster an effective dialogue and build partnerships between health authorities, radiation protection regulatory bodies, practitioner organisations, equipment manufacturers, patients, and families. Facility-based and system-wide actions are complementary for the establishment and maintenance of a radiation safety culture in paediatric imaging. Integration avoids duplication and promotes synergy.

Local implementation of a globally developed improvement model saves resources. The WHO plays a leading role in facilitating and coordinating improvement actions in different regions and settings.

The event was reported by the co-organizers, their members and the media. Examples include: Aunt Minnie Europe; Diagnostic Imaging, Healthcare IT and Radiation Therapy Trade Association; EuroSafe Imaging; Health Management; Image Gently; International Organisation for Medical Physics; International Society of Radiology; International Society of Radiographers and Radiological Technologists; World Federation of Pediatric Imaging; and World Organization of National Colleges, Academies and Academic Associations of General Practitioners / Family Physicians.

As one of the event’s leading initiators and co-organizers, the ISR posted an article about “Imaging for Saving Kids” in its website and issued a supporting press statement. The ISR is committed to improving the access to safe and more appropriate use of paediatric imaging and is working with other stakeholders on this top priority.
AFROSAFE is a campaign developed by the Pan African Congress of Radiology and Imaging (PACORI) and radiation health workers in Africa. The campaign was launched on 17th February 2015, at Laico Hotel in Nairobi, Kenya during the 8th scientific congress of PACORI. The ceremony was presided by the Director of Medical Services, Ministry of Health, Kenya Dr. Nicholas Muraguri. The minister pledged the support of the government towards the realization of AFROSAFE objectives.

AFROSAFE’s main objective is to unite the stakeholders with a common goal, to identify and address issues arising from radiation protection in medicine in Africa. The genesis of this campaign is a result of the Joint Position Statement by the IAEA and WHO known as the “Bonn Call-for-Action”, which was published in December 2012. The links between the AFROSAFE objectives and Bonn Call-for-Action are shown in Table 1.

The vision of AFROSAFE is to achieve that: “All radiation-based medical procedures in Africa are beneficial.” AFROSAFE plans to meet its goals through supporting adherence to policies, strategies and activities for the promotion of radiation safety.

The key challenges of radiation safety in Africa are:

- Inadequate / lack of adherence to institutional clinical practice guidelines;
- Minimal funding and engagement in radiological research;
- Lack of policies and regulation in the training and practice of the radiation medicine profession;
- Inadequate awareness of the radiology safety policies; and
- Non-adherence to laid-down procedures for procurement, maintenance, decommissioning and disposal of radiology equipment.

Implementation of AFROSAFE actions will be carried out by steering committees (SCs) in each country or each professional society. This steering committee will report to the AFROSAFE executive. A country steering committee may consist of individuals or representatives of institutions, i.e.:

- Radiologist
- Radiographer
- Medical physicist
- Representative from radiology association(s)
- Representative from radiography association(s)
- Training institutions
- Patient Interest groups

The steering committee in professional societies will be decided by the individual professional society depending on the society’s organizational structure. It is expected that societies like the African Society of Radiology, African Society of Pediatric Imaging, etc. will set up their local steering committees for the purpose of implementing the goals of AFROSAFE.

AFROSAFE will coordinate activities between the societies. At two yearly intervals, common themes may be set to guide and synchronize the activities of organizations, regions and countries in Africa. AFROSAFE will collaborate with other professional societies, organizations, agencies, and radiation-safety campaign groups, to build on and capitalize on lessons and successes of these societies for the purpose of effective implementation its activities and to avoid duplication. These may include IAEA, WHO, ISoR, ACR, ESR, RAD-AID, Image Gently, Image Wisely and others.

(Article courtesy of Prof. Michael G. Kawooya, Past President PACORI; General Secretary African Society of Radiology; and one of the Conveners of the AFROSAFE Campaign.)

The AFROSAFE Declaration

We, the radiation health workers of Africa declare that we shall, through the creation of the AFROSAFE campaign, promote the safe and beneficial use of radiation through the following actions:

1. Ensure that benefits outweigh risks in all radiological medical procedures;
2. Foster regular radiation dose monitoring, recording and reporting;
3. Campaign for the establishment and implementation of regulations to standardize the practice of radiation health workers;
4. Promote and assist in the development of policies, guidelines and appropriateness criteria for the safe use of radiation of health care at all levels;
5. Advice and advocate for the establishment of procurement procedures of radiological equipment as per national guidelines;
6. Promote and assist in the conducting of regular professional development and training on radiation safety;
7. Advocate for the creation of public awareness on radiation safety;
8. Lobby for research funding in radiation safety; and
Table 1: AFROSAFE strategic objectives

<table>
<thead>
<tr>
<th>AFROSAFE OBJECTIVES</th>
<th>BONN CALL-FOR-ACTION ITEMS</th>
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<tr>
<td><strong>Objective 1:</strong> to strengthen the overall radiation protection of patients, health</td>
<td>Items 8 and 10: radiation safety culture and implementation</td>
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<td>workers and public</td>
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<tr>
<td>a. Enhance quality assurance programs in medical exposures</td>
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<td>b. Each country to maintain a register of all radiation workers and their annual</td>
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<td>cumulative doses, the radiation-emitting equipment</td>
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<td>c. Standardize radiation monitoring of workers and radiological facilities</td>
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<tr>
<td>d. Regular monitoring and documentation of radiation sources by the institutions and</td>
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<td>submission to regulatory bodies</td>
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<td></td>
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<td><strong>Objective 2:</strong> to promote safe and appropriate use of ionizing radiation in medicine</td>
<td>Items 1, 4 and 8: justification, education and training of health worker, radiation safety culture</td>
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<td>a. Policy guidelines on the safe use of radiation from the community to national level</td>
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<td>b. Regulations to standardize the practice of all radiation workers (code of conduct)</td>
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<td>c. Institutionalize the role of medical physicists in radiation medicine</td>
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<td>d. Institutionalize appropriateness criteria</td>
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<td>e. Develop and introduce radiation protection teaching modules into medical curricula</td>
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<td>f. Continuous professional development and training on radiation protection at all levels</td>
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<td><strong>Objective 3:</strong> to foster improvement of the benefit-risk dialogue with patients and</td>
<td>Items 6 and 9: global information and benefit-risk dialogue</td>
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<td>the public</td>
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<tr>
<td>a. Awareness creation of radiation safety through public lectures, print and electronic</td>
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<tr>
<td>media</td>
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<tr>
<td>b. Regular reporting of radiation dose analyses in publications, seminars and conferences</td>
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<td><strong>Objective 4:</strong> to enhance the safety and quality of radiological procedures in medicine</td>
<td>Items 2 and 7: optimization, prevention of incidents/accidents through audit</td>
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<td>a. Improve image quality through clinical-specific facility protocols</td>
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<td>b. Documentation of patients' radiation doses in all procedures in order to develop dose</td>
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<td>data (radiation dose tracking)</td>
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<td>c. Regular audit of imaging techniques</td>
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<td>d. Encourage reporting of incidents and accidents in radiation protection</td>
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<td><strong>Objective 5:</strong> to promote safety in radiological equipment and facilities</td>
<td>Item 3: manufacturer’s role</td>
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<td>a. Enforce procurement procedures as per national regulation</td>
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<td>b. Regular maintenance and calibration of equipment</td>
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<td>c. Enforce radiation safety in facility layout</td>
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<td>d. Ensure safety features in radiation equipment</td>
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<tr>
<td><strong>Objective 6:</strong> to promote research in radiation protection and safety</td>
<td>Item 5: research</td>
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<tr>
<td>a. Prioritize research in radiation safety at institutional and national level</td>
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<tr>
<td>b. Increase research grants in radiation issues</td>
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Imaging referral guidelines have been in existence since 1989. The aim of early guidelines was largely to reduce unnecessary, unhelpful examinations by identifying the best test first. Objectives have since broadened to include, in addition to appropriateness of imaging, radiation safety through choice of low or no dose procedures taking into consideration patient sensitivity and choice, as well as cost-effectiveness, a challenging indicator with paucity of outcome data.

Much of the early work at the end of the last century came from three countries: Australia, USA, and the United Kingdom. Print versions from the Royal Australian and New Zealand College of Radiologists and Royal College of Radiologists (RCR) were produced in the 1990s. The American College of Radiology (ACR) led digital distribution through a web-based format, now used widely.

Early versions of imaging referral guidelines and appropriateness criteria were aimed at general practitioners and junior doctors as well as radiologists to help justify requests according to best medical practice. Since then targeted users have widened to include non-medical healthcare practitioners such as Emergency Nurse Practitioners, reflecting the trend in some countries to strengthen skills-mix with appropriate guidance. Current versions of referral guidelines have maintained the emphasis on general practitioners and emergency care.

The methodology behind guideline development and review has become more formalized over the years requiring a robust evidence-based process with scheduled review. Guidelines are still wholly dependent on volunteer experts who give their time and expertise freely, through an evidence-informed consensus system such as the Delphi process used by the ACR and RCR. The ability of smaller countries to develop their own guidelines has been limited by resources, both human and financial.

Initiatives by international and regional organizations (e.g. WHO, IAEA, European Commission) to encourage adopting and adopting existing guidelines by countries and regions has resulted in good practices throughout the world with guidelines translated into multiple languages and available through smart-phone and tablet applications (Fig. 4). This has brought evidence-based advice closer to practitioners working in lower income regions where power and broadband internet access are limited.

The value of referral guidelines is undoubted with early studies showing typically a 20% reduction in imaging utilization in higher income countries. Recent evidence focuses on more appropriate use of imaging rather than reduction in absolute numbers. Appropriateness in some regions may mean more rather than less imaging. Dose reduction is more difficult to demonstrate but in Europe there is no doubt that the countries (UK and Finland) which strongly advocate referral guidelines are also those with the lowest per capitated collective effective dose.

Wider use of and compliance with referral guidelines remain challenges. Strategies to address these include educational initiatives; clinical decision support systems by bringing guidance closer to the referring practitioner; audit with feedback possibly through multidisciplinary team meetings or reports; and promoting, through awareness, a radiation safety culture with collective responsibility for quality and safety, a goal for all countries.

References:

(Article courtesy of Dr. Denis Remedios)
A one-day Training Course on “Justification of Diagnostic Imaging and Use of Referral Guidelines” was conducted in Dubai, UAE in September 2014 through a Cooperation Program of the WHO and ISR. This activity was strongly supported by the Dubai Health Authority (DHA) and Sheikh Hamdan Award for Medical Sciences since the use of referral guidelines is one of the key strategies used to improve patient safety and dosimetry.

Thirty participants from the public sector, private sector, and regulatory authorities attended this Training Course (Fig. 5). Local, WHO and ISR experts jointly delivered the program. The course was well-balanced covering basics in radiation safety, principles of imaging, overview and use of referral guidelines, guideline development methodology, and implementation issues. Local experts provided local perspective, experience and challenges.

The panel discussion was well received with active participant contribution. Based on their feedback, a number of actions were proposed to move this project forward (Table 2).

Twenty participants provided additional feedback through a questionnaire. These participants include ten diagnostic imaging practitioners, nine referring practitioners, and one health administrator.

Amongst the stakeholders, awareness, access and use of referral guidelines are low. Referrer access and use of referral guidelines vary; 8/10 imaging practitioners do not have access to or use of referral guidelines. An exception is the Nuclear Medicine Department in the Dubai Hospital, which uses the European Association of Nuclear Medicine guidelines.

All respondents recommended the mandatory use of referral guidelines. The majority of respondents were comfortable with either a tabulated or algorithmic format. The preferences for guideline access are via Internet (16/20) or a mobile device (14/20); while only a few preferred the print format.

All respondents recommended that the training course should be repeated and future courses to include physicians from different specialties. Additional topics could include a roadmap for development and implementation of referral guidelines, steps to promote the use of guidelines at the point of care and practical steps to prevent overuse of radiation procedures. The course could be further enhanced by allocating more time for Q/A and panel discussion, case studies, examples from the local scenarios, and practical examples of referral guideline use.

(Article courtesy of Dr. Jamila Salem Al Suwaidi and Dr. Priyank Gupta, Dubai Health Authority)

Table 2: The next steps

1. Secure endorsement for the use of referral guidelines from the Federal Authority for Nuclear Regulation (FANR) and health regulation departments via the UAE DHA National Radiation Protection Committee;
2. Build a public education team to promote awareness amongst patients;
3. Conduct a pilot project and trial 5-10 guidelines to assess feasibility and outcome;
4. Strengthen referrer awareness by active educational initiatives by focusing on undergraduates, residents, and practitioners; and
5. Consider applying mandatory CPD and hosting targeted courses for practitioners on procedure justification and referral guidelines.
IAEA Technical Meeting on Tracking the Radiation Exposure of Patients

The IAEA is conducting a project to develop methodologies to track radiation exposure of patients. The “Smart Card/SmartRadTrack” project was launched in 2006. It includes the following possibilities:

a. An electronic card that contains a patient’s information, including radiation exposure history.
b. A card only as a digital signature to access the radiation exposure data that is actually available online. A patient-accessible website can serve as a ‘virtual’ card.
c. The information about radiation exposure history is made available in e-health records in a manner that can help track individual patients’ exposure over time. With interoperability, it should provide the possibility of access from anywhere.
d. In countries where neither an electronic card nor e-health record is feasible, a methodology to achieve information on tracking all radiological procedures, such as a radiation passport, somewhat like a vaccination card, could be initiated.

The project is aimed at:

1. Developing methodologies to track radiation history, be it the number of radiological procedures and/or radiation dose as appropriate;
2. Helping Member States establish policies and mechanisms for tracking indices of radiation exposure for diagnostic examinations and interventional procedures involving ionizing radiation to individual patients;
3. Developing guidance where the number of procedures alone, rather than dose, are sufficient which, combined with generic radiation dose figures, can provide dose estimates;
4. Providing information to strengthen the basic tenets of radiation protection, namely justification and optimization;
5. Cooperating with bodies associated with manufacturers to aid in developing hardware and software for tracking of procedures and individual patients’ radiation dose indices;
6. Promoting development of international standards for tracking radiological examinations and procedures across different countries; and
7. Making provisions in safety standards to require tracking of radiological examinations and procedures to assess cumulative radiation dose to individual patients.

The project has made steady progress following a number of consultations and technical meetings. A Technical Meeting on this project was held on 28-30 April 2015. With permission from the IAEA Radiation Protection of Patient’s unit, the following is a reprint of a recently published article entitled: Technical Meeting on Tracking the Radiation Exposure of Patients in the RPOP site about the discussions.

The Technical Meeting was held by the IAEA on 28-30 April 2015 on the above subject (Fig. 6). Background about the project called Smart Card/SmartRadTrack and information about previous meetings held and outcomes can be accessed at the RPOP site.

The meeting included countries that have already established a system for tracking of radiological procedures and radiation dose and countries that are actively considering establishing a system. In addition, referring medical practitioners were also present.

The purpose of the meeting was:

- To bring together those countries that already have systems in place for the tracking of radiation exposure history and to deliberate on the experience they have gained;
- To prepare information material on the successful approaches for patient exposure tracking that could help other countries in the process of establishing a similar system; and
- To develop a common standpoint on whether the information about the number of previous radiological examinations should be considered in decision-making regarding referral for the next examination.

Main conclusions of the meeting were:

1. The experience from countries which have established regional or national system is encouraging in terms of use of both tracking of radiological procedures and dose. The consolidated information containing images with clinical information and dose has been found to be useful. Having individual patient’s dose tracking has been found to provide added value. Individual dose tracking helps in optimizing follow up examination as the patient acts as his/her own standard in consideration of clinical condition.
2. For countries in the process of establishing a similar system:
a. It will depend upon individual country’s health system, availability of resources, insurance system, societal considerations, data security and confidentiality, ethical aspects and regulatory framework;
b. Standardisation of nomenclature of examinations is one of the most important aspects;
c. Use of permanent ID for medical records is essential; and
d. The involvement of all related health professionals and stakeholders is important.
3. The decision making for any imaging examination involves analysis of benefits of examination, radiation risk of examination and risk of not undertaking the examination. While this guidance is good in principle, practical situations in daily life warrant further guidance as:
a. In patient centric care, including dose information from previous examination as a standard part of patient’s medical record will help provide a holistic reflection of the quality and safety of patient’s care while also encouraging physician’s awareness of patient’s radiation protection; and
b. The decision for the examination at hand should primarily be based on benefit versus risk of current examination but there should also be an awareness of risk from patient’s prior radiation history.
4. Tracking of procedures is useful to
   a. Avoid repeated exams for the sake of access to prior exams; and
   b. Audit cases of questionable self referral.
5. Benefits of tracking dose have already been consolidated in paper
   on Templates and existing elements and models for implementation
   of patient exposure tracking.
6. Referring medical practitioners should be provided with dose
   information in addition to imaging information and radiology report
   with clinical information.
7. Dose information in reference dose quantities from previous imaging
   studies should also be a standard part of the patient record and it
   should be visible in simple (better in graphic) form to medical
   practitioner in particular referring practitioners without having to look
   into a separate system.
8. Electronic referral system with decision support should have a
   reminder at point of referring (e.g. as pop-up window system) that can
   help referring physicians keep radiation exposure in mind and
   encourage them to consider alternative imaging modalities (US, MRI)
   when clinically appropriate.
9. Knowledge of prior dose alone should not influence decision making
   for next examination. However, there are clinical scenarios where
   justification is in gray zone (e.g. chronic patients requiring repeated
   exams, indications that require follow-up examinations, young patients
   to name a few) where consideration of radiation risk from previous
   exposures may influence decision making.
10. There is a need to develop a risk assessment methodology starting
    from reference dose quantities provided by imaging equipment and
    leading to risk figures that are simple and provide the level of accuracy
    sufficient for clinical practice.
11. There is a heightened need for the use of cumulative dose for
    optimization of examinations to avoid tissue reactions (deterministic
    effects).
12. Issues where caution needs to be exercised with advice of
    experienced medical physicist:
    a. Automatic conversion of reference dose quantities to obtain effective
dose and using it without consideration of age, gender and body mass; and
    b. Automatic comparison of individual dose figures with diagnostic
    reference levels.
13. Issues where further deliberations are needed include:
    a. Development of guidance on risk assessment of multiple examinations
    to determine time interval for next examination; and
    b. Further clarifications on how to use incremental and cumulative risks to
    aid in process of decision making for future examinations in light of
    previous exposure history.
14. Clinical guidelines should be developed for situations where repeated
    radiological examinations are needed. They should include consideration
    of radiation risks and of other examinations that do not involve ionizing
    radiation.
15. There is a substantial opportunity and need to improve education
    and maintain competence of practitioners pertaining to radiation risk.
    Any clinician who refers a patient for a radiological examination should
    have knowledge about typical radiation doses associated with imaging
    examinations, and an understanding of how they relate to patient risk.
16. There is a need to develop training material specifically oriented
    towards referring medical practitioners with due consideration
    of repeated examinations and radiation risks to enhance patient protection.
    The language and style should be clinically oriented such as case based,
    such that it can make a difference in routine practice.
17. IAEA should develop a TECDOC that includes comprehensive
    information on radiation dose recording and tracking for individual patient
    and also dose tracking for quality control purpose at institutional level.

(Article courtesy of the Radiation Protection of Patients Unit,
Department of Nuclear Safety and Security, International Atomic
Energy Agency)
In 2009 a joint task force of the American College of Radiology (ACR) and Radiological Society of North America (RSNA) identified the need to address growing concerns about radiation associated with medical imaging, especially computed tomography (CT), nuclear medicine procedures, and fluoroscopy. The ACR and RSNA, along with the American Association of Physicists in Medicine (AAPM) and the American Society of Radiologic Technologists (ASRT), established the Image Wisely® campaign with the goals of raising awareness for appropriate indications for imaging and optimizing the dose for indicated radiologic examinations.

Image Wisely® was charged with creating educational resources for imaging professionals: radiologists, medical physicists, technologists and medical imaging consumers: referring physicians, patients, and the public. Additionally, Image Wisely® was directed to broadcast these resources by using a variety of electronic and print media, to institute initiatives that ensure adoption of best practices in optimization of dose, and, through networking, to solicit the involvement and participation of affiliated health care organizations, educational institutions, government agencies, and vendors of imaging equipment.

Image Wisely® was launched at the RSNA Annual Meeting in 2010 including a website featuring material for its CT initiative. Subsequent initiatives have provided content for nuclear medicine (2012) and most recently for fluoroscopy (2014).

Individuals, facilities, and associations are able to show their support for the campaign and their commitment to safe imaging by pledging online. So far, over 32,000 individuals, 1,100 facilities, and 50 associations have done so. An example of the pledge for imaging professionals is shown in Table 3.

In addition, radiology practices are encouraged to have their imaging sites accredited and to join the ACR Dose Index Registry which is a national database to track CT examination dose. Currently, almost 900 imaging facilities participate in the Dose Index Registry submitting dose parameters on over 16.5 million CT exams. Aggregation of this data by exam type will allow monitoring of CT dose in one’s practice and the ability to compare doses to other practices in North America. In addition, aggregation of this CT dose data will provide parameters to establish meaningful Diagnostic Reference Levels (DRL’s) by CT exam type.

In 2013, Imagewisely.org began offering its physician, medical physicist, and imaging technologist visitors the chance to earn free continuing education credits with a new feature, the Image Wisely® Radiation Safety Case. The site posts a new interactive case 4 times a year. This has become a popular attraction for imagewisely.org users.

Image Wisely® activities are routinely overseen by an Executive Committee chaired by Richard Morin, PhD for the ACR and William Mayo-Smith, MD for the RSNA. Executive committee members frequently make presentations for the campaign and are invited to sit on national and international panels. They are currently involved in discussions with colleagues from Europe, where the EuroSafe campaign has been launched and Africa where plans for an AfroSafe campaign are just beginning.

Collaboration with these and other safety efforts within the United States and around the world is one of the defining characteristics of the Image Wisely® campaign.

References:
(Article courtesy of William W. Mayo-Smith, MD, Richard Morin, PhD and Wil Creech of Image Wisely®)

Table 3: The Image Wisely Pledge for imaging professionals

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<th>Yes, I want to Image wisely.</th>
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<tr>
<td>I wish to optimize the use of radiation in imaging patients and thereby pledge:</td>
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<tr>
<td>1. To put my patients’ safety, health, and welfare first by optimizing imaging examinations to use only the radiation necessary to produce diagnostic-quality images;</td>
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<td>2. To convey the principles of the Image Wisely program to the imaging team in order to ensure that my facility optimizes its use of radiation when imaging patients;</td>
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<td>3. To communicate optimal patient imaging strategies to referring physicians, and to be available for consultation; and</td>
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<td>4. To routinely review imaging protocols to ensure that the least radiation necessary to acquire a diagnostic-quality image is used for each examination.</td>
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This article is a follow-up of an earlier article prepared by the authors, featured in the January edition of Quality News.

Information exchange through a dedicated public website on radiation protection of patients

The website, available in English and Spanish, commonly known as RPOP website was launched in 2006. It has been a significant instrument of the IAEA to communicate information to health professionals, patients, and the public on benefits and risks of ionizing radiation in medical applications.

The RPOP website is regularly updated and provides training packages in three languages and posters in over 20 languages for free download and use. It offers links to all relevant IAEA publications, current literature, and latest news. The website has immense outreach in 213 countries. Social media, such as Facebook and Twitter, are also used to disseminate medical radiation protection information.

Radiation safety reporting and learning systems

IAEA maintains two voluntary web-based incident reporting and learning systems. SAFRAD (SAFety in RADIological procedures) can be used to report incidents of patient exposure during fluoroscopy-guided diagnostic and interventional procedures which are above defined trigger levels. SAFRON (SAFety in Radiation ONcology) is for the reporting of significant patient safety events in radiotherapy and for prospective risk analysis to improve radiation safety and delivery of radiotherapy.

In 2009, the IAEA launched the Information System on Occupational Exposure in Medicine, Industry, and Research (ISEMIR) focussing on health professionals. This project led to the design and development of the ISEMIR international database on Interventional Cardiology. The purpose is to provide an active tool for assessing the level and hence guiding the implementation of radiation protection principle of optimization of protection at a given interventional cardiology facility.

The responses from IAEA surveys conducted during various training courses indicated that regular and appropriate use of personnel monitoring device by interventionists is mostly lacking e.g. only 33-77% of interventional cardiologists utilize radiation badges routinely. In 2008, IAEA launched an international study entitled Retrospective Evaluation of Lens Injuries and Dose (RELID). A number of eye testing examinations have been held. This study demonstrated a significantly increased incidence of radiation-associated lens changes in interventional cardiology workers. As a result, there is an urgent need to educate interventionists in radiation protection to reduce the likelihood of cataract development.

Technical cooperation activities for patient dose management

The IAEA is assisting Member States in capacity building and skill development for justification and optimization of protection in medical exposures. The technical assistance to lower and middle income (LMI) countries is provided, by delivery of equipment, training, fellowships and scientific visits for knowledge exchange.

A common approach has been established with the scope customized for each country. The method consists of classifying the work into detailed tasks, including dedicated tasks on dose management in CT and interventional radiology, with a particular focus on pediatric patients. Over 80 LMI countries carry out work plans on patient dose assessments, whereas the IAEA provides assistance in performing the work in the form of equipment support, staff training, literature support and expert assistance. The IAEA regional and national projects on patient protection achieved a significant dose reduction of more than 30% while maintaining image quality.

For more information, visit us at https://rpop.iaea.org.

(Article courtesy of Dr. Jenia Vassileva and Dr. Ola Holmberg, Radiation Protection of Patients Unit, Department of Nuclear Safety and Security, International Atomic Energy Agency)
QUALITY NEWS

Quality and safety initiatives from the American College of Radiology

In our recent revision of the ACR Strategic Plan, quality continues to be a core value of the American College of Radiology (ACR). We aspire to continue our leadership role in the development and deployment of programs designed to help radiological professionals deliver safe, high-quality care. We place a high priority on making tools and resources available that enable our members to provide the highest quality services to their patients.

For decades, ACR members and staff have devoted time and resources to that end. Most recently our activities have focused on how our organization can provide resources such as workflow integrated tools for our members to provide value to their patients, referring physicians and health systems throughout the imaging value chain focusing on patient experience and safe, effective and efficient radiological care. The ACR quality and safety programs are strongly aligned with the ACR's Imaging 3.0 initiative.

Introduction

The ACR believes that the whole process of medical imaging including having accurate clinical history, appropriate image requests, optimal imaging acquisition, accurate interpretation, actionable reporting, and effective communication including follow-up and treatment planning can be enhanced to improve quality and patient safety related to imaging. A framework that is patient-centered rather than physician-centered is also a key feature of providing high quality care.

The patient experience with imaging typically begins with consideration of whether imaging is necessary to establish or exclude a diagnosis, and when necessary, what is the most appropriate study. Patients need to be appropriately educated and prepared before arriving for their imaging examinations. Imaging protocols need to be tailored to answer the clinical question and informed by the patient’s history and prior studies. Image acquisition must follow appropriate procedures to avoid exams done on the wrong patient or side, or incomplete coverage of anatomy, which may lead to incorrect diagnoses or delayed diagnosis. Accurate interpretations by qualified and credentialed physicians with results and actionable recommendations conveyed to the referring physician clearly and timely are essential.

The referring physician can then use the information from the imaging report and any subsequent discussions with the interpreting physician in combination with other clinical information to formulate a plan for the care of the patient. Results, including actionable recommendations, must be clear to patients, and processes should be in place to assure appropriate follow-up is obtained. Systematic feedback on imaging physicians’ performance allows physicians to monitor their outcomes and institute improvements as needed. Figure 7 shows how quality improvement can occur at each step in the imaging chain beginning with selecting the appropriate examination until referring physicians and their patients full understand their examination results and recommendations.

Figure 7: Quality improvement opportunities in the imaging chain.
Quality News

Quality and safety initiatives from the American College of Radiology

Initiatives for appropriate use and justification of medical imaging

The ACR believes that if an imaging examination is not appropriate for the patient's medical condition then that examination has no value and even has a risk of downstream harms including unnecessary radiation exposure. The ACR has developed evidence-based referral guidelines, the ACR Appropriateness Criteria®, which are included in the United States National Guidelines Clearinghouse. There are nearly 200 topics with over 900 variants that provide evidence-based decision support in choosing the most appropriate diagnostic imaging/therapeutic examination based on the patient's diagnosis.

The United States has legislatively mandated the use of clinical decision support by referring physicians for advanced diagnostic imaging examinations based on appropriate use criteria for Medicare beneficiaries beginning January 1, 2017. ACR Select is the ACR's clinical decision support tool that delivers the content in the ACR Appropriateness Criteria® to the referring physician at the time requests are generated. The tool integrates with the electronic health record and order entry systems to provide guidance on selection of diagnostic imaging examinations in conjunction with information on patient history and status. The tool also can initiate a radiologist consultation to supplement the content delivered electronically because although guidelines are useful, one of the most valuable resources a radiologist can offer is a pre-order radiology consultation to help referring physicians decide on the best study for the patient.

The ACR has worked closely with our colleagues in the European Society of Radiology in the development of a similar tool, ESR iGuide, for use in Europe that is based on ACR Select. Justification for the use of ionizing radiation is an important consideration in the WHO-IAEA Bonn Call-For-Action. At a recent meeting, the IAEA considers the promotion and local adaptation of existing appropriate use criteria superior to development of additional guidelines. The United States has legislatively mandated the use of clinical decision support by referring physicians for advanced diagnostic imaging examinations based on appropriate use criteria for Medicare beneficiaries beginning January 1, 2017. ACR Select is the ACR's clinical decision support tool that delivers the content in the ACR Appropriateness Criteria® to the referring physician at the time requests are generated. The tool integrates with the electronic health record and order entry systems to provide guidance on selection of diagnostic imaging examinations in conjunction with information on patient history and status. The tool also can initiate a radiologist consultation to supplement the content delivered electronically because although guidelines are useful, one of the most valuable resources a radiologist can offer is a pre-order radiology consultation to help referring physicians decide on the best study for the patient.

The ACR Select describes numerous imaging examinations with limited or no value for specific clinical circumstances.

Mechanisms for registry reporting and feedback mechanisms are under development that will provide benchmarks to provide feedback to referring physicians and other health care providers. The feedback is designed as an educational tool for the referring provider, and as a mechanism to channel information from the referring provider to the guideline development process to facilitate improvements in guidelines. Choosing Wisely®, incorporated into ACR Select, describes numerous imaging examinations with limited or no value for specific clinical circumstances.

Radiologists from the ACR and the Radiology Society of North American (RSNA) have developed a patient-facing portal, Radiologynof.org, to provide information about imaging procedures and patient preparation necessary for the examination. Referring providers can use these resources to help educate their patients so diagnosis is not delayed due to inadequate preparation.

Protocol selection

The ACR has a number of tools to assist institution of imaging protocols to improve diagnostic accuracy and minimize radiation exposure. ACR Practice Parameters and Technical Standards have been developed for 165 (127 collaborative with other societies) common and emerging radiological procedures. These parameters help advance the science of radiology and improve the quality of service to patients. They describe specific training, skills and techniques that promote the safe and effective use of diagnostic and therapeutic radiology. ACR Practice Parameters and Technical Standards assist in examination design, protocol creation, ensure diagnostic quality images, promote standardization of how procedures are performed, and minimize diagnostic errors.

Image acquisition and joint initiatives for radiation safety

Image Gently, which focuses on pediatric imaging, and Image Wisely, which focuses on adult imaging, offer ways to mitigate patient risk by optimizing exposure to ionizing radiation. Optimized protocols allow the lowest exposure while assuring image quality is sufficient to support accurate interpretation and diagnosis.

The American Association for Physics in Medicine (AAPM) recommend protocols to standardize practice across CT scanners for optimizing image quality while adhering to ALARA (As Low As Reasonably Achievable) radiation exposure principals, for example, protocols for CT screening for lung cancer.

The ACR also published guidance for MR safety, which sets industry standards for safe and responsible practices in clinical and research MR environments. The ACR follows the IAEA’s A-A-A model of “Awareness”, “Accountability”, and “Audit” in radiation safety.

In addition to promoting awareness through Image Gently and Image Wisely, we have a number of programs for practices to demonstrate accountability and benchmarking through audit processes. The Diagnostic Imaging Center of Excellence (DICOE) program provides a comprehensive assessment of the medical imaging facility, including structure and outcomes. Areas of assessment range from governance, facility organization and management, radiation safety and quality management. Participation in two ACR National Radiology Data Registries (NRDR) - the ACR Dose Index Registry® (DIR) and General Radiology Improvement Database (GRID) are required.

The use of registries, such as the DIR allows facilities to audit and compare their dose data to that of other similar facilities across the United States and internationally. Most recently, the ACR NRDR has been approved by the Centers for Medicare and Medicaid Services (CMS) as a qualified clinical data registry for use in the CMS physician quality reporting and value modifier accountability programs.

ACR accreditation

Accreditation programs are also a key feature of ACR quality initiatives. ACR modality specific accreditation programs (Mammography, Breast Ultrasound & biopsy; Breast MRI, Stereotactic Breast Biopsy, MRI, CT, Nuclear Medicine, & PET, Ultrasound, Radiation Oncology) with image review establish standards for image quality and also educate facilities on how to improve. Accreditation in the United States is mandated under two laws, MIPPA (Medicare Improvements For Patients And Providers Act) for advanced diagnostic imaging and MQSA (Mammography Quality Standards Act) mammography.
QUALITY NEWS

Quality and safety initiatives from the American College of Radiology

The ACR recently created a Quality Management Committee (QMC) that will coordinate ACR quality and benchmarking efforts. The QMC will improve and expand ACR quality tools and infrastructure to practices with point-of-care tools to record/ document quality and value and help achieve our vision of Imaging 3.0. The QMC is developing Radiology Quality Officer (RQO) training to provide quality improvement training and ongoing mentoring. RQOs can lead development and growth of their practice’s quality infrastructure, become value visionaries and future quality champions and leaders.

Additionally, ACR Quality Control Manuals are available for each modality to assist facilities develop and maintain quality control programs. The ACR Committee on Drugs and Contrast Media maintains the Contrast Media Manual, as a guide for radiologist to enhance the safe and effective use of contrast media. Finally, the ACR has developed a Preparedness and Implementation of Imaging in Biocontainment Situations (Ebola) manual for management of biocontainment issues.

Maintaining interpretive skills

The ACR has also developed methods for peer review to help radiologists maintain their interpretive skills. Currently the ACR RadPeer tool provides web-based simple, cost-effective process that allows peer reviews to be performed during the routine interpretation of current imaging. Peer review is a required component of ACR facility accreditation. For peer review to be successful at highlighting and reducing errors, it must be provided in a “peer learning” atmosphere.

RadPeer will be expanded to help radiologists detect incorrect interpretations of various types, learn from one another, and identify areas for educational focus. Advances in peer review programs might include self-assessment cases to be embedded in the daily workflow to help guide educational activity of the interpreting physicians. The infrastructure for peer-review and learning is still evolving, and there are now scientific frameworks specific to radiology for understanding and classifying errors to further reduce them. With the evolution of better tools, radiology practices have the capability to conduct peer-review and learning as part of their normal practice without having to set aside dedicated time. The tool may optimize case selection and streamline workflow to better integrate peer-learning.

Tools for actionable reporting

The ACR is working with the health information technology industry to integrate decision support tools for radiologists into our electronic health records, PACS systems and dictation software. Improving critical results reporting is an important initiative for the ACR and our Actionable Reporting Workgroup has recently published guidelines for integrating actionable findings and recommendations into daily workflow. Additionally the ACR Incidental Findings Committee and our Informatics Commission is developing a tool for standardized recommendations (ACR Assist) that can be integrated into dictation software to allow access to evidence-based recommendations.

Tools for follow-up and regulatory requirements

Registry reporting of actionable findings will be quite helpful in ensuring patients receive appropriate follow-up. Additionally registries will be critical to population health management and as research tools in a continuously learning health care system. Registries that can collect data real time through the electronic health record, scanners, PACS or reporting systems are available for radiology facilities and physicians and can be enhanced to monitor, benchmark, and improve performance. Benchmarking and reporting as part of the quality management framework initiative can identify the aspects of radiological care that are most meaningful to monitor for improved diagnostic performance. These can also assist in compliance with existing United States quality programs such as CMS’s Physician Quality Reporting System (PQRS) and Maintenance of Certification (MOC) for the American Board of Radiology.

For consistency in interpretation and recommendations, there are lexicons and algorithms, such as the BI-RADS® system used for mammography reporting. These provide a common lexicon structure for reports, evidence-based recommendations based on the findings, a communication system for referring physicians and patients, a critical result management system, and a quality monitoring framework with registry reporting. Reporting and Data Systems (RADS) are standardized categories to report on interpretation of images for specific clinical conditions. They offer guidance on management recommendations and are generally supported by lexicons and example images to define and describe standard terminology. These RADS typically contain structured reporting templates and include: ACR BI-RADS® Atlas, Head Injury Imaging Reporting and Data System (HI-RADS), Liver Imaging Reporting and Data System (LI-RADS), Lung CT Screening Reporting and Data System (Lung-RADS™) and Prostate Imaging Reporting and Data System (PI-RADS) with other under development and consideration.

Conclusion

The ACR has a long-standing commitment to quality and safety in radiology. The College has numerous programs designed for advancing safe and effective radiological care. Our Strategic Plans calls for the ACR to maintain its leadership role for the profession in radiological quality and safety both nationally and internationally, and we are committed to working with the international radiological community through the International Society of Radiology (ISR) and its International Commission on Radiological Quality and Safety (ICQRS) to assist organizations such as the WHO and IAEA in collating existing resources as they work toward improving radiological quality and safety worldwide.

References:


(Article courtesy of Bibb Allen, Jr, MD Chair ACR Board Of Chancellors; Pamela A. Wilcox, RN, MBA; Judy Burleson, MHS; and Mythreyi Bhargavan Chatfield, PhD, American College of Radiology)
The Quality and Safety (QuaS) Program of the Royal Australian and New Zealand College of Radiologists (RANZCR), as its name suggests, focuses on the quality and safety of radiology services in Australia and New Zealand.

The program has a broad scope, with much of its work undertaken through collaboration with a large range of external stakeholders as well as highly skilled radiologists. Until recently, nearly all of the work of this program was funded by the Australian Commonwealth Government; however this has changed with RANZCR now supporting this program directly.

The knowledge and experience developed by undertaking the multitude of projects over the years has created valuable resources, and has enabled the College to contribute to national quality and safety initiatives.

In the last year, the program has provided major input into national quality and safety projects led by other agencies including: Reduction in Radiation Exposure to Children from CT Scans (Australian Commission on Safety and Quality in Health Care, ACSQHC); the Australian Atlas of Healthcare Variation (ACSQHC); and Choosing Wisely (National Prescribing Service). In contributing to this latter project, RANZCR’s list of 6 items that clinicians and consumers should question was informed by the evidence base developed for the Education Module project described below.

Recently the QuaS program has completed or has ongoing activity around a wide variety of projects and some highlights are described below:

**Educational modules for appropriate imaging referrals**

Aimed at improving the appropriateness of referrals for medical imaging, an educational intervention for young health professionals about the place of imaging in patient care has been developed. A suite of resources to support implementation and clinical care have been produced for this project, including interactive online modules, iBooks, flowcharts and smart phone apps. The resources address a range of common clinical settings such as decision making prior to referral for CT of the brain or cervical spine in the context of trauma.

**InsideRadiology**

This website provides consumers and health professionals with accurate, up-to-date and easily accessible information about medical imaging tests and procedures. Covering 97 topics and 189 individual downloadable items, this website has a significant Australian and International presence, the site now receiving over 3 million hits per month.

**CT dose optimization quality improvement activities**

With an overarching goal to address the variation in dose delivered to patients undergoing CT examinations, the College has supported a series of state-based dose optimization projects over the years. The most recent project sought to determine if the dose reductions achieved as a result of these projects were sustained over time, providing some justification for the initial costs of optimization education and training.

**Radiology Events Register (RaER)**

This project is designed to undertake systematic data collection and analysis of adverse incidents and discrepancies in radiology to inform quality improvement and patient safety. The RANZCR continues to support this important initiative to engender a safety culture within the College, and particularly to encourage radiology trainees to reflect on quality and safety during their education.

(Article courtesy of The Royal Australian and New Zealand College of Radiologists)
QUALITY NEWS

Japan DRLs 2015

Like many countries, Japan is experiencing an escalating use of radiological procedures while there is increasing public awareness and concerns about potential radiation health effects. When appropriately justified and optimized, a procedure’s benefits out-weight its risks. Best practice guidelines facilitate procedure selection, and patient-tailored protocols ensure adequate diagnostic data is obtained, and radiation protection is met.

Diagnostic Reference Levels (DRL)

The International Commission on Radiological Protection (ICRP) recommends the use of DRLs to improve the optimization of radiation protection of patient undergoing diagnostic procedures.

DRLs apply to groups of similar patients to compare and ensure the procedure doses do not deviate significantly from those at peer facilities unless there is a known, relevant, and acceptable reason. National DRLs is a useful radiation protection tool to improve practice and procedure optimization. However, the DRL concept is not well understood by many practitioners and facilities. Table 4 outlines the key elements relating to the use of DRLs.

In addition to the ICRP, international organizations and agencies, e.g. International Atomic Energy Agency (IAEA), United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), World Health Organization (WHO), and others advocate for the strengthening of medical exposure data collections and use of DRLs worldwide. Recent publications such as the International Basic Safety Standards and Bonn Call-for-Action highlighted these recommendations.

Japan Network for Research and Information on Medical Exposures (J-RIME)

The J-RIME was formed in 2010 to engage the stakeholders, to share information on medical radiation exposure within and outside Japan, and to work towards a national framework for radiation protection from medical exposure.

As of 2015, J-RIME has functioned as a nationwide network with participation from academic institutions, professional societies, national and international organizations and agencies, equipment suppliers, government authorities, individual experts and other stakeholders.

One of J-RIME’s activities is to collect medical exposure data arising from radiological procedures in Japanese facilities and to construct a Japanese framework for appropriate protection from medical exposure based on international trends.

Japan DRLs 2015

In June 2015, the collaborating organizations approved the publication of “Japan DRLs 2015”. These organizations include: Japan Association on Radiological Protection in Medicine, Japan Association of Radiological Technologists, Japan Network for Research and Information on Medical Exposure, Japan Radiological Society, Japan Society of Medical Physics, Japanese Radiation Research Society, Japanese Society for Oral and Maxillofacial Radiology, Japanese Society of Nuclear Medicine, Japanese Society of Nuclear Medicine Technology, Japanese Society of Pediatric Radiology, and Japanese Society of Radiological Technology, in collaboration with The Japan Medical Imaging and Radiological Systems Industries Association, and the National Institute of Radiological Sciences.

This first set of DRLs from Japanese facilities is the work of many experts, including physicians, radiological technologists and medical physicists, based on the results of the latest nationwide surveys.

The J-RIME will share this data with other stakeholders to improve awareness and facilitate clinical use of DRL to improve practice in radiological facilities. This data will be regularly reviewed and updated.

References:


(Article courtesy of Prof. Yoshiharu Yonekura MD PhD, Chair, J-RIME and President, National Institute of Radiological Sciences)

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<thead>
<tr>
<th>Table 4: Some helpful hints relating to the use of DRLs</th>
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<tr>
<td>✓ DRLs are not dose limits, they should be used as investigation tools;</td>
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<td>✓ DRLs are not applicable to individual patients;</td>
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<td>✓ Comparison with DRLs shall be made using mean or median values of a sample of patient doses;</td>
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<td>✓ Quantities used as DRLs should be easily measured;</td>
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<td>✓ The use of DRLs should be made in conjunction with the evaluation of image quality or diagnostic information;</td>
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<td>✓ DRLs should be applied with certain flexibility, i.e. allowing tolerances for patient size, condition, etc;</td>
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<td>✓ DRLs are not differentiators for good or bad practice;</td>
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<td>✓ Values that are UNDER the DRLs may not necessarily be optimised values;</td>
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<td>✓ Values that are OVER the DRLs should require an investigation and optimization of the x-ray system or operational protocols;</td>
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<tr>
<td>✓ DRLs should be used in a dynamic and continuous process of optimization;</td>
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<tr>
<td>✓ The goal in using DRLs is not to reduce patient doses if image quality or diagnostic information is compromised; and</td>
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<tr>
<td>✓ Compliance or faults with DRLs should be discussed with the staff of the imaging department.</td>
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