Image Wisely® - Updates on the US Campaign for Radiation Safety in Adult Medical Imaging

Poster No.: ESI-0002
Congress: EuroSafe Imaging 2018
Type: EuroSafe Imaging
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Keywords: Action 7 - Medical radiation protection research: MELODI, EURAMED, Action 12 - Cooperation with international radiation protection initiatives and other stakeholders including IAEA, WHO, ICRP, HERCA, European Commission, Radioprotection / Radiation dose, CT, Radiation safety, Workforce
DOI: 10.1594/esi2018/ESI-0002

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Background/introduction

Image Wisely® is an initiative developed by the American College of Radiology (ACR), Radiological Society of North America (RSNA), American Association of Physicists in Medicine (AAPM) and American Society of Radiologic Technologists (ASRT) to raise awareness and provide up-to-date educational resources for radiology professionals and referring clinicians regarding the use of ionizing radiation in adult medical imaging examinations [1]. A major aspect promoting awareness is through the initiative's annual pledge.

The goals of Image Wisely® are to provide information on:

- Optimizing ionizing radiation techniques for clinical indication and patient size, and
- Monitoring exam radiation dose indices to enable comparison to established reference levels

This educational and awareness initiative is conducted through a website (www.imagewisely.org) which provides links to current literature and dose-related news, information on imaging protocols, links to pertinent regulatory and standards organizations, as well as educational materials.

Over the past year, the Image Wisely® campaign has engaged in multiple activities with the goal of raising awareness and providing up-to-date educational resources regarding the use of ionizing radiation in adult medical imaging examinations. These have included the creation of the "Radiation Sensibilities" column in the Journal of the American College of Radiology, international collaborative efforts with other members of the International Society of Radiology's Quality and Safety Alliance, an enhanced website, and continuation of the annual Image Wisely® pledges.
Description of activity and work performed

1. **Radiation Sensibilities**

Image Wisely® and Image Gently® proposed the publication of practical topics related to the use of ionizing radiation in the "Radiation Sensibilities" column to the Journal of the American College of Radiology (JACR). Topics from Image Wisely® included "An Introduction to Radiation Sensibilities"[2], "Image Wisely: The Beginning, Current Status, and Future Opportunities"[3], "The Link Between Radiation Optimization and Quality" [4] (see Figure 1), "The Medical Physicist's Role in Radiation Optimization" [5] and "Radiation Optimization in an Academic Training Program" [6].

2. **International collaboration**

The Image Wisely® Executive Committee collaborated with our partners around the world in various national and international meetings. Leaders from Algeria, Canada, Chile, France, Japan, Uganda and the United States of America (USA) shared their similar missions for informed use of ionization radiation in medical imagining and image-guided procedures at the Radiological Society of North America (RSNA). RSNA's Refresher Course, "Around the World in 80 Minutes: Current Global Campaigns for Informed Use of Radiation in Medical Imaging." This was the first time all major global partners aligned through the International Society of Radiology's Quality and Safety Alliance (ISR-QSA) presented together at the same venue.

In addition, Image Wisely's Executive Committee members and colleagues shared their expertise at RSNA's Discovery Theater during the Annual Meeting: "Image Wisely® Formation, Mission, Challenges and Vision" by Dr. Mayo-Smith, "Update on Image Wisely® - Radiation Safety Cases" by Dr. Gingold, "Image Wisely® - Team Approach to Teaching Radiation Safety" by Drs. Bancroft and Sensakovic, and "How the RSNA can help you: Image Wisely® and Beyond" by Drs. Applegate and Whitman.

Furthermore, team members spoke about Image Wisely® activities at the International Atomic Energy Agency (IAEA)'s International Conference on Radiation Protection in Medicine and European Congress of Radiology (ECR) in Austria, American Academy of Physicists in Medicine (AAPM) in the USA,
Sonic Imaging Conference (SIC) in Australia and Asian Society of Abdominal Radiology (ASAR) in Korea.

1. **Enhanced Website**

   Image Wisely® enhanced its website with new and updated content. "Regulations and Standards Updates" on the homepage directs imaging professionals to important governmental and imaging standard requirements (see Figure 2). Image Wisely® also added newsworthy content on "News" and "What We're Reading," new Radiation Safety Cases, new RSNA Educational Exhibits and updated material on "Imaging Modalities" (see Figures 3 and 4).

2. **Annual Pledges**

   Image Wisely® engaged state chapters, physician educational programs and technologist educational programs in Image Wisely's annual pledge. These pledges are renewed on an annual basis and revolve around optimizing the use of radiation, depending upon the role of the various providers. Pledges can be made by imaging professionals (see Figure 5), referring practitioners, imaging facilities, and associations/educational programs around the world (see Figure 6).
The Link Between Radiation Optimization and Quality

William F. Sensakovic, PhD, David R. Warden IV, MD, Laura W. Bancroft, MD

The application of radiation to a patient for medical procedures should be governed, in part, by the principle of optimization of protection [1]. This principle answers the question: When performing an imaging procedure, are we keeping dose as low as reasonably achievable, taking into account economic and societal factors? This ensures that the benefit-to-risk ratio is maximized when a procedure is performed. The risk associated with medical imaging is typically thought of as detriment caused by radiation. This detriment takes the form of possible cancer in the image receptor. Each photon that passes through the patient and is absorbed in the receptor adds information to the image; thus too few photons result in insufficient information in the image. This is typically visualized as an increase in mottle (noise) and a corresponding decrease in signal-to-noise ratio (SNR) (i.e., detectability). A rule of thumb is that quadrupling the quantity of photons hitting the receptor halves noise and doubles SNR, so large changes in dose are often required to make an appreciable impact on image quality.

Additionally, as energy increases, the amount of radiation blocked by different tissues becomes similar, which also reduces contrast. Luckily, the decrease in contrast with increasing energy is relatively small (except for imaging contrast media) and in projection imaging can often be offset by image processing for moderate energy increases (~10 kV).

Optimization occurs through improvements in technique and technology. What is considered “sufficient” for image quality is task specific, and technique optimization focuses on identifying tasks using...
**Fig. 2:** Figure 2. Image Wisely® enhanced its website with new and updated content. For example, "Regulations and Standards Updates" on the homepage directs imaging professionals to important governmental and imaging standard requirements.

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**Fig. 3:** Figure 3. Enhanced website features for General Radiation Safety.

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How to Understand and Communicate Radiation Risk

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(Updated March 2017)

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Many medical imaging examinations involve exposure to ionizing radiation. The exposure amount in these exams is very small, to the extent that the health risk associated with such low levels of exposure is frequently debated in scientific meetings. Nonetheless, the prevailing scientific view is that there is a finite (though small) amount of risk involved with such exposures. The risk is increased with the amount of exposure, repeated exposures, and when the patient is young. This material aims to provide a brief overview of the risks associated with medical imaging examinations that involve ionizing radiation.

Fig. 4: Figure 4. Updated articles on the Image Wisely website.

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Fig. 5: Figure 5. Image Wisely® pledges are renewed on an annual basis and revolve around optimizing the use of radiation, depending upon the role of the various providers.

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Fig. 6: Figure 6. Image Wisely® pledge distribution by countries around the world.

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Conclusion and recommendations

The Image Wisely® campaign continues to raise awareness and provide up-to-date educational resources for radiology professionals and referring clinicians regarding the use of ionizing radiation in adult medical imaging examinations. The Executive Committee regularly publishes practical topics, engages in international collaboration, enhances its communication, and receives annual pledges in order to optimize the use of radiation in medical imaging.
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Image Wisely® Executive Committee

www.imagewisely.org
Fig. 7: Image Wisely Executive Committee.

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References