

Image Gently, *Step Lightly*: increasing radiation dose awareness in pediatric interventional radiology

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Children and radiation safety

The National Council on Radiation Protection and Measurement reported in March 2009 that radiation dose to the United States population had risen sevenfold since the early 1980s. CT and nuclear medicine are the two largest contributors to medical radiation, with fluoroscopic exposure during interventional procedures the third largest contributor, accounting for 7% of the total medical radiation dose to the U.S. public [1]. The readers of *Pediatric Radiology* are well aware of the risks of unnecessary and excessive medical radiation to our pediatric patients. While children undergo interventional procedures less commonly than adults, the use of interventional radiology (IR) in pediatric care is increasing, and some more complex procedures can result in long fluoroscopic times. Further, children with chronic illnesses may undergo many IR

procedures, and receive a higher cumulative dose from repeated exposures [2–6]. Just as with CT, it is our responsibility to actively promote radiation protection during IR cases. The Image Gently, *Step Lightly* campaign is a new effort of the Alliance for Radiation Safety in Pediatric Imaging. Using the information provided on the website (www.imagegently.com), interventional radiologists can access valuable educational tools to help minimize radiation dose to themselves, to their medical colleagues in the IR suite, and most importantly, to their pediatric patients.

Pediatric interventional radiology and Image Gently

The field of pediatric interventional radiology has developed a more focused identity in the last 5 years as a result of growth into a critical mass of practitioners and increasing

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Fig. 1 Image Gently logo, reproduced on a sticker insert in the September issue. The sticker is meant to be placed at the point of use in your angiography suite, as a reminder to “child-size” the technique when performing pediatric interventional radiology procedures

Fig. 2 Downloadable checklist to review with the team prior to each pediatric IR procedure. The checklist is a reminder of steps that can be taken to reduce dose to patients and staff, to the extent possible in each case

Step Lightly Checklist

Review steps below before starting the procedure.

Safety is a team effort: don't be afraid to ask the necessary questions to ensure you are working as a team to keep radiation dose to patients and staff as low as possible

Reducing radiation dose must be balanced with safe, accurate and effective completion of the procedure. Not all the steps below may be possible in each case, depending on patient size, technical challenge and critical nature of the procedure. Overall patient safety is most important. The goal is to minimize the dose to the patient while providing important and necessary medical care.

| | |
|--------------------------|--|
| <input type="checkbox"/> | Ask patient or family about previous radiation (link to imaging record). Answer questions about radiation safety (link to patient brochure) |
| <input type="checkbox"/> | Use ultrasound when possible |
| <input type="checkbox"/> | Position hanging table shields and overhead lead shields prior to procedure with reminders during the case as needed |
| <input type="checkbox"/> | Operators and personnel wear well fitted lead aprons, thyroid shield and leaded eye wear |
| <input type="checkbox"/> | Use pulse rather than continuous fluoroscopy when possible, and with as low a pulse as possible |
| <input type="checkbox"/> | Position and collimate with fluoroscopy off, tapping on the pedal to check position |
| <input type="checkbox"/> | Collimate tightly. Exclude eyes, thyroid, breast, gonads when possible |
| <input type="checkbox"/> | Operator and personnel hands out of beam |
| <input type="checkbox"/> | Step lightly: tap on pedal and review anatomy on last image hold rather than with live fluoroscopy when possible; minimize live fluoroscopy time |
| <input type="checkbox"/> | Minimize use of electronic magnification; use digital zoom whenever possible |
| <input type="checkbox"/> | Acknowledge fluoroscopy timing alerts during procedure |
| <input type="checkbox"/> | Use last image hold whenever possible instead of exposures |
| <input type="checkbox"/> | Adjust acquisition parameters to achieve lowest dose necessary to accomplish procedure: use lowest dose protocol possible for patient size, lower frame rate, minimize magnification, reduce length of run |
| <input type="checkbox"/> | Plan and communicate number and timing of acquisitions, contrast parameters, patient positioning and suspension of respiration with radiology and sedation team in advance to minimize improper or unneeded runs |
| <input type="checkbox"/> | Move table away from X-ray tube in both planes. Move patient as close to detector in both planes |
| <input type="checkbox"/> | Use power injector or extension tubing if hand injecting |
| <input type="checkbox"/> | Move personnel away from table or behind protective shields during acquisitions |
| <input type="checkbox"/> | Minimize overlap of fields on subsequent acquisitions |
| <input type="checkbox"/> | After procedure: record and review dose |

need for scientific research and collaboration in the field [7–10]. The Society for Pediatric Interventional Radiology was formed in 2007 (www.spirweb.org), and there are robust pediatric IR subcommittees within the Society of Interventional Radiology (www.sirweb.org) and the Society for Pediatric Radiology (www.pedrad.org). In 2008 the Alliance steering committee invited a multidisciplinary group to develop educational materials for a new campaign in pediatric interventional radiation awareness and reduction, modeled after the successful campaign in CT.

Radiation safety in pediatric intervention: *Step Lightly*

The *Step Lightly* campaign aims to educate the health-care team and the public on the desirability of reducing radiation

dose as much as possible in pediatric IR, while also emphasizing the tremendous benefits of IR procedures to patient care. As with the Image Gently CT campaign, there are separate sections for patients, radiologists, technologists, pediatricians, physicists and the media. Educational materials are easily accessible on the Image Gently website and encourage a team approach in radiation safety education and dose reduction techniques to allow real change to be affected. Specific tools and behavior modifications are available (discussed more below) to minimize the effort required.

Building on the existing Image Gently infrastructure, the *Step Lightly* message is being disseminated to health care professionals through participating Alliance organizations. At the launch of this campaign, a printed advertisement has been placed in selected journals, including *Pediatric Radiology*, along with a sticker with the Image Gently butterfly logo (Fig. 1). The photograph in the advertisement was taken by one of the members of the CT writing group and is of his daughter at ballet practice. This lovely image is meant to remind practitioners to “step lightly” on the fluoroscopic pedal during pediatric interventions, and to leave a small “footprint” on this sensitive population. The accompanying text carries a short message:

Image Gently...

Step Lightly

Interventional radiology helps us save kids' lives!

But, when we treat patients, radiation matters!

Children are more sensitive to radiation.

What we do now lasts their lifetimes.

Treat kids with care:

- *Step lightly* on the fluoroscopy pedal.
- Stop and child-size the technique.
- Consider ultrasound or MRI guidance.

Specific tools for interventional providers

The materials on the website are designed to be accessible and to make it easy for providers to follow the best practice procedures. For example, the parent brochure is not only useful for patients, but also provides an organized approach for providers to use to discuss pediatric IR radiation safety with families. These tools are also meant to be used by the whole IR team, based on the findings that a team approach with a mutually reinforced and articulated vision can reduce error [11,12]. To aid team education, the website contains a downloadable PowerPoint presentation on principles and practical tips for radiation safety in pediatric IR. This slide presentation contains information about unique features of pediatric intervention in regards to radiation protection, practical safety tips, visuals demonstrating safe practices,

and information regarding dosimetry and quality improvement. Providers may use this slide show at their institution to review radiation safety in pediatric IR with their team and to teach trainees. In addition, with the knowledge that surgical safety checklists have been shown to reduce surgical complications, a downloadable checklist, the “Step Lightly Procedure Checklist,” is provided and may be used by the IR team to review pediatric radiation safety steps prior to each case (Fig. 2) [13]. There is also a more comprehensive protocol outline of specific steps to be taken throughout the entire process to improve safety entitled “Steps for Radiation Safety.” Lastly, the website contains links to other useful sites and reference articles for more in-depth reading.

Summary

The Image Gently, *Step Lightly* campaign is the next phase of the ongoing efforts of the Alliance for Radiation Safety in Pediatric Imaging. Building on the lessons learned and the successes of the initial CT campaign, the Alliance and its new interventional partners hope that the same success and awareness of radiation minimization can be brought to pediatric interventional practice. Accessible information and tools are provided for health professionals and the public to work as a team in achieving this goal. To learn more, please visit www.imagegently.com.

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