

# Update: Image Gently and Nuclear Medicine at 10 Years

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**N**uclear medicine offers well-established and valuable clinical diagnostic instrumentation and techniques in several disciplines, including urology, neurology, orthopedics, and oncology (1). Although radiation exposure from nuclear medicine studies is on par with (and often lower than) that of other medical imaging procedures, it is still prudent to limit the amount of radiation exposure to the lowest amount possible without reducing its diagnostic capability. This is particularly relevant in children because their longer life span and developing tissues may be more sensitive to the effects of ionizing radiation (2). It is also essential to be prepared to communicate the potential benefits as well as risks of each procedure with our patients and their families (3).

The Image Gently Alliance was formed in 2007 to help change practice and raise awareness about radiation exposure from medical imaging in children. This effort included the dissemination of free educational materials to patients, parents, and health care providers. The group's mission remains: "through advocacy, to improve safe and effective imaging care of children worldwide."

During the past decade, the Nuclear Medicine Working Group of the Image Gently Alliance has been coordinating efforts toward optimization and standardization of nuclear medicine imaging in children. The Working Group includes physicians, physicists, and technologists working in pediatric nuclear medicine who initially came together in 2007 to address the wide variability of clinical practice. A survey that year of dedicated pediatric hospitals in North America demonstrated an average variation by a factor of 3 in administered activity per body mass (MBq/kg) and a factor of 10 for the minimum administered activity for nuclear medicine procedures (4). This effort was also supported by SNM (now SNMMI), the Society of Pediatric Radiology, and the American College of Radiology. The goals at the time were to monitor current practices in pediatric nuclear medicine in North America and, if necessary, to develop and disseminate guidelines to assist in the standardization of practice.

## Description of Activity and Work Performed

The Working Group developed the North American Consensus Guidelines for Administered Radiopharmaceutical Activities in Children and Adolescents, published in *The Journal of Nuclear Medicine* in 2011 (5). These guidelines provided standard administered activities for 11 nuclear medicine procedures commonly performed in children. The "Go

with the Guidelines" campaign (Fig. 1), sponsored by the Image Gently Alliance and SNMMI, sought to deliver a copy of the guidelines poster to every nuclear medicine clinic in North America. A 2013 follow-up survey of the original North American pediatric hospitals revealed that, in most cases, local protocols had been modified according to the guidelines, resulting in an overall reduction of both radiation exposure to patients and variations in clinical practice (6). A survey of nearly 200 general hospitals in the United States, also performed in 2013, indicated that 83% of the sites knew about Image Gently, 55% knew about the North American Guidelines, and almost all sites that were familiar with the guidelines had modified their practice of pediatric nuclear medicine as a result (7). Following the publication of the North American Guidelines, successful efforts were initiated to harmonize these with the Paediatric Dosage Card developed by the European Association of Nuclear Medicine (EANM) (8).



**FIGURE 1.** "Go with the Guidelines" promotional poster originally distributed in 2007 by the Image Gently Alliance and SNM.

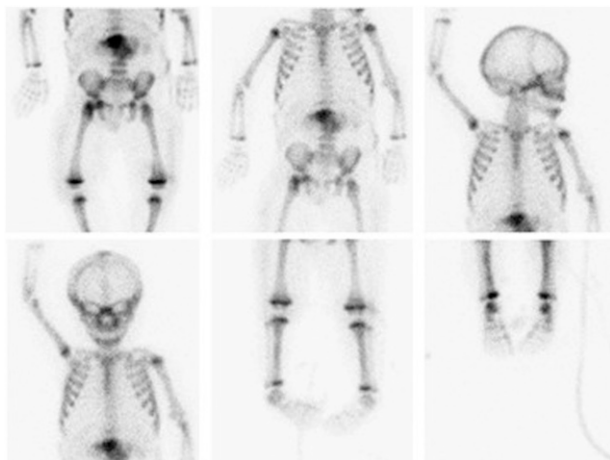


**FIGURE 2.** Image Gently Butterfly Award presentation at the 2017 Radiological Society of North America annual meeting. Drs. Treves (left) and Fahey (right) accepted the award on behalf of the Nuclear Medicine Working Group.

New versions of both the North American Guidelines and the EANM Paediatric Dosage Card were published in 2014 (9). In 2016 (10), 6 additional procedures were added to the guidelines and included in a new poster release (snmmi.files.cms-plus.com/docs/GoWithGuidelines\_files/ImageGentlyPoster\_2017.pdf). These are intended as a guideline only, and local practice may vary depending on patient population, instrumentation, choice of collimator, and specific requirements of clinical protocols. The administered activity may be adjusted for specific cases as appropriate when ordered by the nuclear medicine practitioner. Also, the North American Guidelines are expected to evolve with anticipated changes in radiopharmaceuticals, equipment, software, and clinical applications. The efforts of the Nuclear Medicine Working Group were recognized by the Image Gently Alliance with the 2017 Butterfly Award (Fig. 2). Members of the Working Group over the past 10 years are listed in Table 1.

**TABLE 1**  
Image Gently Nuclear Medicine Working Group

Name	Practice/academic location
S. James Adelstein, MD, PhD	Harvard Medical School, Boston, MA
Adam Alessio, PhD	University of Washington Medical Center, Seattle
Zvi Bar-Sever, MD	Schneider Children's Medical Center, Petah Tikva, Israel
Ronald Boellaard, PhD	University Medical Centre Groningen, The Netherlands
Lise Borgwardt, MD, PhD	Rigshospitalet, Copenhagen, Denmark
Wesley E. Bolch, PhD	University of Florida, Gainesville
Nanci Burchell, CNMT, RSO	Children's Mercy Hospital, Kansas City, MO
Arturo Chiti, MD	Humanitas Research Hospital, Milan, Italy
Royal T. Davis, CNMT	Boston Children's Hospital, MA
Dominique Delbeke, MD	Vanderbilt University, Nashville, TN
Frederic H. Fahey, DSc	Boston Children's Hospital, MA
Eric C. Frey, PhD	Johns Hopkins University, Baltimore, MD
Donald P. Frush, MD	Duke University Medical Center, Durham, NC
Michael J. Gelfand, MD	Children's Hospital of Cincinnati, OH
Marilyn Goske, MD	Children's Hospital of Cincinnati, OH
Frederick D. Grant, MD	Harvard Medical School, Boston, MA
Neha Kwatra, MD	Boston Children's Hospital, MA
Michael Lassmann, PhD	University of Würzburg, Germany
Daniel Levin, MD	University of Manitoba, Winnipeg, Canada
Joanne Louis, CNMT	Boston Children's Hospital, MA
Massoud Madj, MD	Children's National Medical Center, Washington, DC
Helen R. Nadel, MD	Lucile Packard Children's Hospital, Palo Alto, CA
Marguerite T. Parisi, MD, MS Ed	Seattle Children's Hospital, WA
Thomas Pfluger, MD	Ludwig-Maximilians University, Munich, Germany
George Sgouros, PhD	Johns Hopkins University, Baltimore, MD
Barry Shulkin, MD	St. Jude's Children's Research Hospital, Memphis, TN
Michael G. Stabin, PhD	Vanderbilt University, Nashville, TN
Stephanie Spottswood, MD	Children's Hospital at Vanderbilt, Nashville, TN
S. Ted Treves, MD	Harvard Medical School/Brigham and Women's Hospital, Boston MA



**FIGURE 3.**  $^{99m}\text{Tc}$ -methylendiphosphonate bone scan in a 10-mo-old girl with neuroblastoma, with administered activity 80% below the North American Guideline's recommended minimum activity. Image quality was preserved despite an administered activity of 7.4 MBq (0.2 mCi), which was calculated based on body weight. The minimum administered activity from the North American Guideline for this procedure is 37 MBq (1.0 mCi). *Courtesy of S.T. Treves.*

### Summary

Over the past 10 years, the Nuclear Medicine Working Group has helped to standardize radiopharmaceutical administered activities in the practice of pediatric nuclear medicine across North America and to harmonize these practices with those in Europe. An evaluation by the Nuclear Medicine Global Initiative indicated that those regions that have adopted guidelines for pediatric nuclear medicine, in general, have less variability in practice and lower patient radiation doses than those that have not (11,12). Some practitioners have found that the concept of minimum administered activity below which a study may not be acceptable may not be obligatory in all cases. Figure 3 shows an example of a very young patient receiving a  $^{99m}\text{Tc}$ -methylendiphosphonate bone scan of more than adequate quality with a body weight (not minimum dose)-based administered activity that was much lower than that recommended by the North American Guidelines, with an 80% radiation dose reduction.

Moving forward, the Image Gently Nuclear Medicine Working Group seeks to:

- Standardize the use of CT in the context of hybrid imaging including PET/CT and SPECT/CT;
- Reevaluate the use of the concept of “minimum administered activity”;
- Evaluate the use of MR/PET imaging as it relates to further reduction of administered radiopharmaceutical activities and therefore radiation dose;
- Continue to promote and disseminate the current North American Guidelines; and
- Continue to collaborate with the EANM in harmonizing administered activities.

### REFERENCES

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