

# Evaluating an Image Gently and Image Wisely Campaign in a Multihospital Health Care System

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## Abstract

**Purpose:** The efficacy of an Image Gently<sup>®</sup>/Image Wisely<sup>®</sup> radiology departmental campaign consisting of the optimization of CT protocols to reduce dose while maintaining quality, and an educational effort to alter the ordering patterns of referring physicians at a multihospital academic center, was evaluated.

**Methods:** The numbers of CT, MR, and ultrasound studies performed at inpatient, outpatient, and emergency facilities in the hospital system before and after the initiation of the departmental campaign (2010) were obtained for a 10-year period (2004-2014) using a radiology information system. For the same time period, dose per scan (volumetric CT dose index) was obtained through the Dose Index Registry<sup>®</sup>/National Radiology Data Registry for frequently performed studies. Descriptive statistics were used to analyze temporal trends in radiation dose and utilization across differing age groups: <20, 20 to 39, and 40 to 59 years.

**Results:** The radiology information system yielded 865,879 imaging examinations and 4,508,030 patients. Although patient and imaging volume grew annually over the study period (by 6.8% and 4.9%, respectively), CT utilization as a percentage of total imaging decreased, compensated for by an increase in ultrasound use. This was most marked in the youngest age group. MR use as a percentage of total imaging was unchanged. The median volumetric CT dose index for each study protocol was reduced or stabilized.

**Conclusions:** The campaign resulted in a reduction in CT utilization, a reduction in radiation dose per study, and a compensatory rise in ultrasound use. An interactive aggressive educational campaign directed toward referring providers combined with protocol dose reduction efforts can be successful in reducing patient exposure from medical radiation.

**Key Words:** Medical radiation, dose, computed tomography, Image Gently, Image Wisely

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## INTRODUCTION

Between 1998 and 2005, the number of diagnostic imaging studies performed in the United States grew at an annual rate of 4.1%, while the use of CT grew disproportionately faster at 10% per year. The cause of the rapid rise in CT use can be attributed to technological advances, shortened scanning time, and the wide availability of CT scanners. In 2007, in their *New England Journal of Medicine* article, Brenner and Hall [1] (both

biophysicists at Columbia University Medical College in New York) suggested that up to 2% of all cancers in the United States might be attributable to medical radiation from CT. In 2009, Berrington de Gonzalez et al [2] proposed that the development of malignancy in up to 29,000 patients in the United States per year could be due to CT. The potential lifetime risk for radiation-induced malignancy is heightened in children, whose developing organs are more radiosensitive and whose long life span provides a greater amount of time for radiation-induced cancers to manifest [1,3,4]. In a 10-year retrospective study of 11 million Australian children, Mathews et al [5] reported a 24% greater cancer incidence rate for exposed than for unexposed children.

In response to the acceleration in CT use, in 2007 the Alliance for Radiation Safety in Pediatric Imaging was

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formed. This included the Society for Pediatric Radiology, the ACR, the American Association of Physicists in Medicine, and the American Society of Radiologic Technologists. In 2009, the ACR and the RSNA established the Joint Task Force on Adult Radiation Protection. The first group launched Image Gently<sup>®</sup>, which focused on the pediatric population, and the ACR/RSNA coalition (joined by the American Association of Physicists in Medicine and American Society of Radiologic Technologists) launched Image Wisely<sup>®</sup>, directed at the adult patient population. These campaigns shared a common goal of developing and sharing educational resources with providers and consumers to curb unnecessary imaging and reduce radiation exposure [6,7].

Since the initiation of these campaigns, significant changes have occurred. At a single inpatient center in the Midwest, Rayo et al [8] showed a 30% decline in the number of CT examinations, driven primarily by a 37% reduction in abdominal and pelvic CT between 2010 and 2012. Similarly, during the same time period, Burke et al [9] showed a decline in total CT volume in all Medicare and Medicaid patients in North Carolina. Most recently, Parker et al [10] demonstrated a decrease in CT use compensated for by an increase in ultrasound use in a multicenter cross-sectional study focusing on an inpatient pediatric center.

We retrospectively explored the impact of a department-wide effort at our multihospital academic center that was initiated in 2010 to (1) educate our referring community about image utilization and (2) optimize CT protocols to reduce dose while maintaining quality. Trends in physicians' ordering patterns for various diagnostic imaging modalities, as well as CT dose, were evaluated before and after 2010.

## METHODS

This retrospective, HIPAA-compliant study was approved by the medical center's institutional review board. In 2010, a comprehensive campaign was implemented at all sites in our medical center, in concordance with the objectives of Image Gently and Image Wisely. This campaign included dose reduction efforts as well as provider education.

### Dose Reduction Efforts

All CT protocols were reviewed starting in the second half of 2011. CT parameters were adjusted to reduce radiation dose while maintaining optimized image quality.

Low-dose techniques, including pediatric-specific dosing and reduced doses for follow-up examinations, were implemented. See Table 1 for a list of efforts undertaken to reduce the use of ionizing radiation.

### Education

A lecture series was developed that emphasized the potential risks of medical radiation, the appropriate indications for CT, and alternative imaging strategies for common conditions. These were provided to the board of trustees, department chairs, attending radiologists, trainees, medical students, CT technologists, and all incoming house staff members and were also presented at many clinical departmental grand rounds, divisional meetings, and house staff orientations on an annual or semiannual basis. Medical students received, and continue to receive, a dedicated lecture on the risks of medical radiation during their mandatory radiology clinical clerkship.

In the Department of Pediatrics, which has a close working relationship with the Division of Pediatric Radiology, a monthly radiology conference was provided to the house staff in which, on the basis of case studies, the use of imaging and alternative imaging strategies was discussed. Similarly, these discussions were incorporated into the weekly joint pediatric radiology and pediatric surgery conference.

Last, CT technologists and all house staff members were required to complete an online medical radiation module annually.

**Table 1.** Summary of actions taken to reduce ionizing radiation use

1. Reviewed and optimized dose for all CT protocols
2. Educational initiatives
  - Lecture series developed on CT use and the potential risks of medical radiation and delivered to the departments of emergency medicine, surgery, pediatrics, family medicine, and internal medicine and to subspecialty groups
  - Annual lectures presented to all incoming house staff members
  - Monthly lectures presented to medical students during their required radiology clerkship
3. Used pediatric dosing/low-dose technique when appropriate
4. Required annual mandatory medical radiation module for all house staff members and CT technologists
5. Conducted collaborative research to prove usefulness of other imaging modalities over CT in various clinical scenarios

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