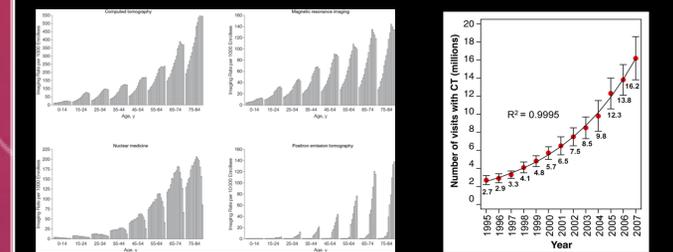


Radiation Safety and ALARA in the Emergency Department: Analysis of Emergency Medicine Residents' Awareness and Patient Dialogue

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Background

Over the past three decades utilization of medical imaging has risen exponentially placing patients at increased risk for associated harmful effects. There is also increased awareness of this risk among the general public. Ordering clinical providers may not be intimately familiar with as low as reasonably achievable (ALARA) and the ACR Appropriateness Criteria, nor be best prepared to handle patient's questions and address concerns regarding radiation from medical imaging.

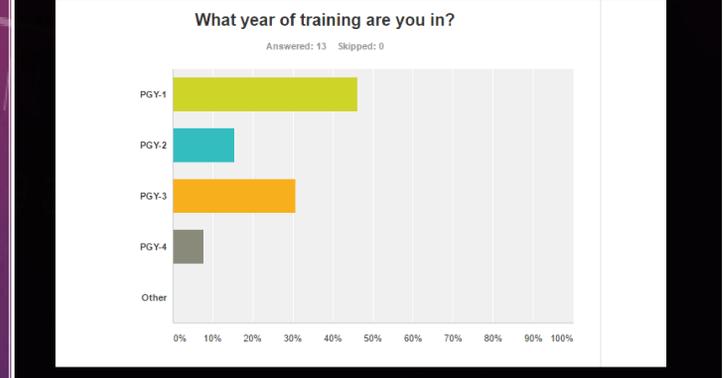


Each cluster of bars represents changing rates of imaging over time within age strata; each bar represents a year from 1996 to 2010.⁵
Number of ED visits involving CT from 1995 to 2007.²

- The Emergency Department (ED) is responsible for approximately one-third of all medical imaging.
- In 2004, only 9% of ED physicians were aware of the increased risks from radiation exposure during diagnostic imaging.
- Direct patient contact places ED physicians in the position to exercise resource management and to educate patients regarding radiation exposure.
- Understanding the clinician's perceptions regarding patient dose, and evaluating their utilization of available tools, such as the ACR appropriateness Criteria, is imperative to access and bridge knowledge gaps to improve patient care.

Methods

We surveyed the Emergency Medicine residents at our institution (PGY-1 – PGY-3) in February of 2016 using an online anonymous survey format to assess their mindfulness of radiation, their patient's mindfulness of radiation, and their radiation knowledge. Thirteen of 24 (54%) of residents responded.



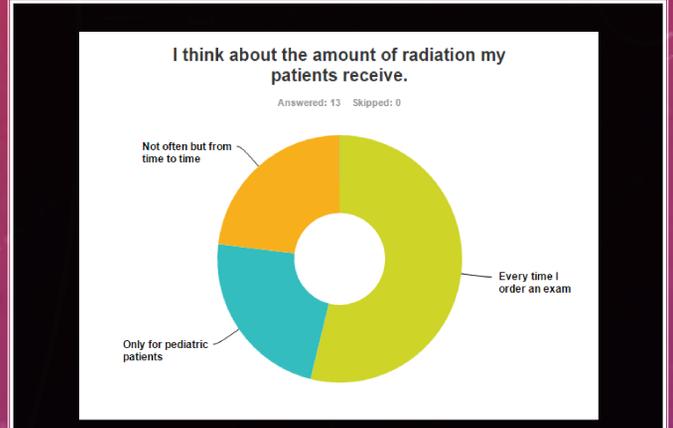
Results

- Nearly all** Emergency Medicine (EM) residents stated they had been asked by their patients at some point in their training to date whether their exams involved ionizing radiation.
- Most residents stated that they are mindful of the radiation exposure caused by medical imaging to their patients, indicating they consider exams that do not involve ionizing radiation.
- However, correct responses to knowledge based radiation questions were inconsistent. Also, use of the ACR Appropriateness Criteria was variable.
- The responses showed no trend with post-graduate year, suggesting potential heterogeneity in exposure to informational sources.

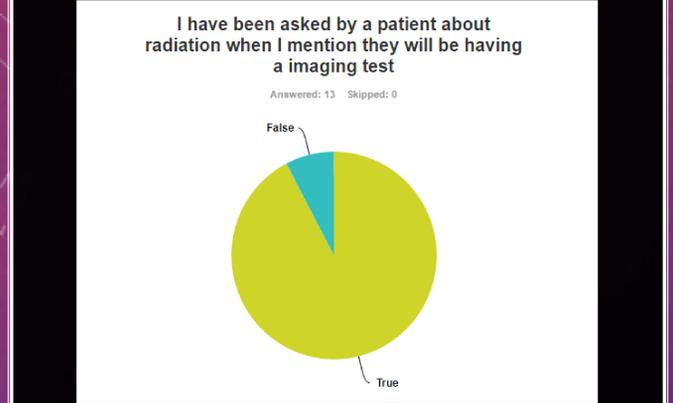
Discussion & Conclusion

- There has been considerable education and awareness regarding radiation exposure and safety in Radiology over the past decade through the initiative of radiology leadership and interest groups and the expansion of radiology educational curriculum (ACR, RSNA, ACGME).
- Although radiology exposure and education is a ACGME curriculum requirement for Emergency Medicine training programs there is no direct educational focus on radiation dose education.
- In addition, our assessment raises the concern that existing educational tools are underused (ACR appropriateness criteria, for example) and this may be due to lack of exposure and awareness regarding their availability.
- Addressing these findings is paramount as the number of imaging studies continue rise, and the public exemplify increased awareness and continue to have direct questions for ordering physicians.
- Unawareness of radiology exam exposure effects the choice of ordering exam, as well as the opportunity for the physician to educate patients regarding their risks.
- Providing non-radiology trainees and physicians the tools to effectively answer patient questions, and to understand how to minimize patient exposure risk, is an important part of achieving ALARA.

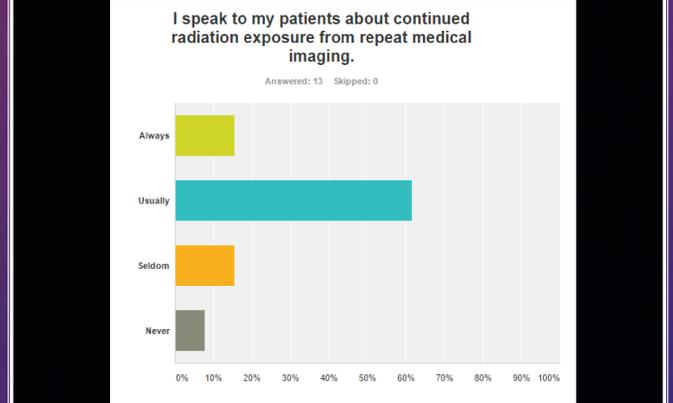
Subjective Survey Responses



Emergency Medicine residents were subjectively surveyed regarding their mindfulness of radiation exposure when caring for their patients. All respondents were mindful of radiation exposure to some extent; 85% every time an exam is ordered, 23% only for pediatric patients, 23% "not often but from time to time". None of the respondents selected the answer choice "Never" (not pictured).

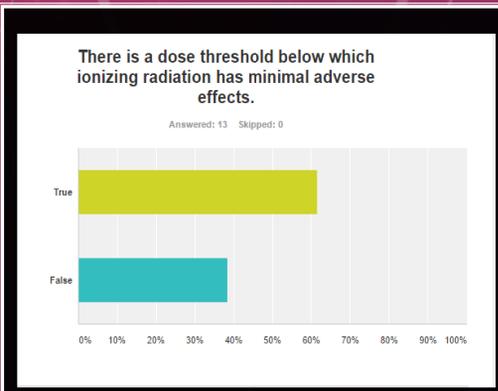


Emergency Medicine residents were subjectively surveyed eliciting whether there is concern regarding radiation exposure among their patients. All respondents, with the exception of one (senior level resident) had been asked about radiation when informing their patients that the patient would be undergoing an imaging exam.

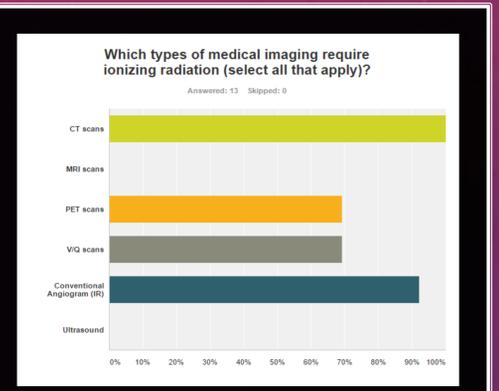


Emergency Medicine residents were surveyed whether they inform their patients of the increased risks of **repeat medical imaging**. Most respondents, with the exception of one senior level resident, speak to their patients about exposure risks at varying intervals (**always (15%), usually (54%), or seldom (38%)**).

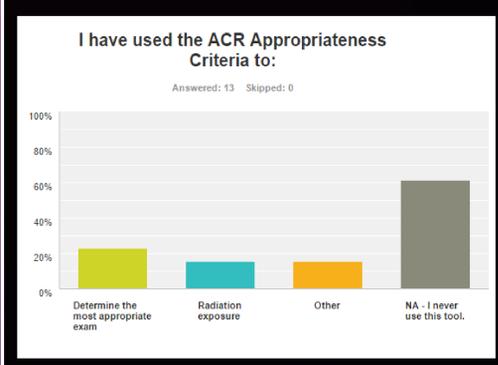
Radiation Knowledge Based Responses



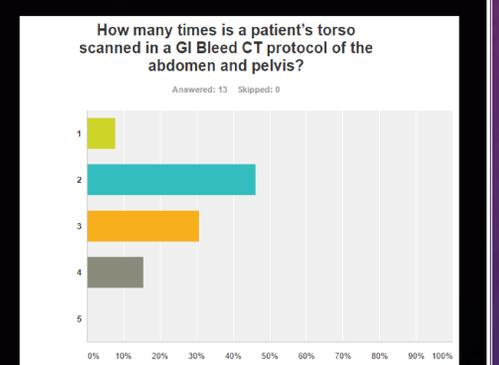
Emergency Medicine residents were asked radiation knowledge based questions regarding dose threshold and its resulting harmful effects. 62% percent stated that there was a dose threshold below which there are minimal adverse effects, while 32% stated there was no such relationship.



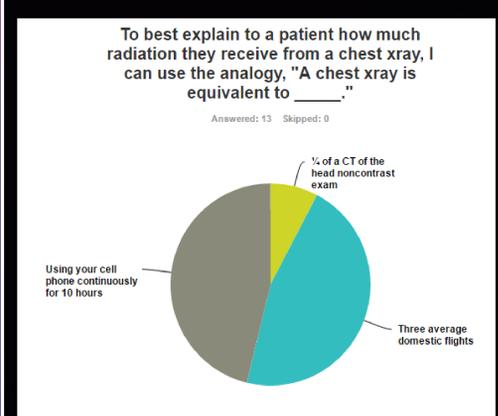
Emergency Medicine residents were asked which types of imaging studies used ionizing radiation. These responses were largely correct. Two PGY-1 level residents and two upper level residents were unaware V/Q scans contained radiation. Four upper level residents were unaware PET scans contained radiation.



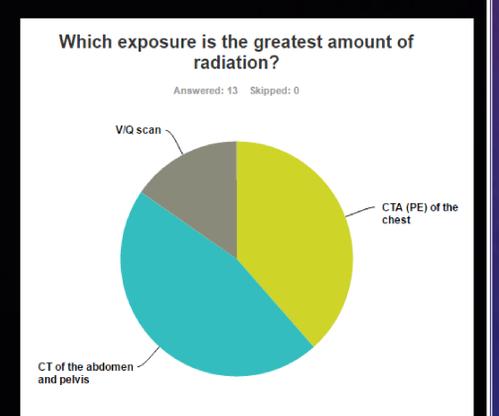
Emergency Medicine residents were asked if they used the ACR appropriateness criteria and for what purpose. 23% percent of respondents used the ACR appropriateness criteria for determining the most appropriate study, 61% percent of respondents had never used this tool.



Emergency Medicine residents were asked whether they knew how many times a patient was scanned for a gastrointestinal bleed study. At our institution, our protocol is acquired by scanning three times (non-contrast, arterial phase, and delayed scans). 30% percent of respondents answered correctly.



Emergency Medicine residents were asked what is an equivalent exposure to one chest xray. 46% percent answered correctly selecting the answer choice "three average domestic flights". No respondents selected the in correct choice "1% of an atomic bomb" (not pictured).



Emergency Medicine residents were asked which of 3 exam exposes the patient to the greatest radiation. Fifteen percent selected the correct answer, V/Q scans. Dosing to the alternative answers, CT of the abdomen and CTA chest PE are nearly similar on average (14 mSv versus 15 mSv, respectively) in attempt to discern them from V/Q scan (2-3 mSv).

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