

# Physician Trainee Knowledge Of Radiation Risks Associated With Diagnostic Imaging: A Survey Of ACGME Accredited Residents And Fellows At A Large Academic Medical Center

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# Introduction

- The link between diagnostic imaging and carcinogenesis is an important patient safety issue.
- Ionizing radiation exposure from medical imaging has increased over the past 30 years as CT and nuclear stress tests have become widespread.
- While radiation risk assessment remains controversial, scientific consensus holds that radiation protection should assume a “linear no threshold” model.
- Even low doses of ionizing radiation could potentially increase the risk of cancer.

# Introduction

- Patients undergoing diagnostic imaging exams may have concerns regarding radiation safety.
- In the academic setting, physician trainees (interns, residents, and fellows) often place orders for diagnostic imaging exams.
- Similarly, physician trainees are in a position to discuss the potential risks of radiation with their patients.
- **AIM:**
  - To evaluate radiation safety knowledge of postgraduate physician trainees across a variety of specialties.

## Materials & Methods

- IRB Exempt Status (Emory University IRB)
- **Study population:**
  - 1,238 interns, residents and fellows enrolled in ACGME accredited programs at Emory University as of May 2016
- **Survey Design:**
  - Produced on SurveyMonkey and distributed via email to Emory University Graduate Medical Education listserv.
  - Survey instrument was based on a previously published survey regarding physician knowledge of the costs of imaging.

# Materials & Methods

- **Survey Instrument:**
  - Queried respondents for basic demographic information
  - Asked respondents about their prior education related to radiation risk during medical school and training programs
  - Asked respondents to estimate relative radiation exposure for the following studies according to the ACR Relative Radiation Level Scale:
    - Whole body PET/CT scan
    - Dissection protocol CT chest abdomen pelvis
    - MRI Lumbar Spine
    - CT abdomen pelvis with and without contrast

## Materials & Methods

- **Survey Instrument (cont'd):**
  - Respondents were also asked to:
    - Estimate the radiation dose of a chest CT relative to a chest radiograph.
    - Estimate the lifetime relative risk of a radiation induced malignancy for a 25 year old undergoing a CT of the abdomen & pelvis.
    - Choose the appropriate imaging exam to investigate pulmonary embolism in a pregnant patient

## Materials & Methods

### ■ Data Analysis:

- Statistical Analysis was largely derived from a previously published survey regarding physician knowledge of the costs of imaging.
- Answers to the demographic questions were summarized by frequencies.
- Answers to the radiation safety portion of the survey were coded as dichotomous responses (correct vs. incorrect).
- Incorrect responses pertaining to radiation dose/risk assessment were further categorized into over and underestimates.

# Results

Table 1:  
Response rate  
and respondent  
characteristics

Table 1: Respondent Characteristics	
<i>Survey Response Categories</i>	<i>Total (%)</i>
Total Survey Recipients	1238
Returned Surveys	270 (21.8)
Incomplete Surveys	24 (1.9)
Completed Surveys	246 (20)
<i>Level of Training</i>	<i>Number of respondents (%)</i>
PGY 1	48 (19.5)
PGY 2	50 (20.3)
PGY 3	40 (16.2)
PGY 4	51 (20.7)
PGY 5	38 (15.4)
PGY 6	14 (5.7)
PGY 7	4 (1.6)
<i>Status</i>	<i>Number of respondents (%)</i>
Intern	54 (22)
Resident	145 (58.9)
Fellow	47 (19.1)
<i>Medical School &amp; Residency Education</i>	<i>Number of respondents (%)</i>
Participated in a Radiology elective in medical school	142 (57.7)
Radiation safety education during preclinical years	97 (39.4)
Radiation safety education during clinical years	98 (39.8)
<i>Physician perception of radiation safety</i>	<i>Number of respondents who agree (%)</i>
It would have been beneficial to have more radiation safety teaching in medical school	168 (68.3)
I possess adequate radiation safety knowledge to care for and counsel patients	126 (51.2)

# Results

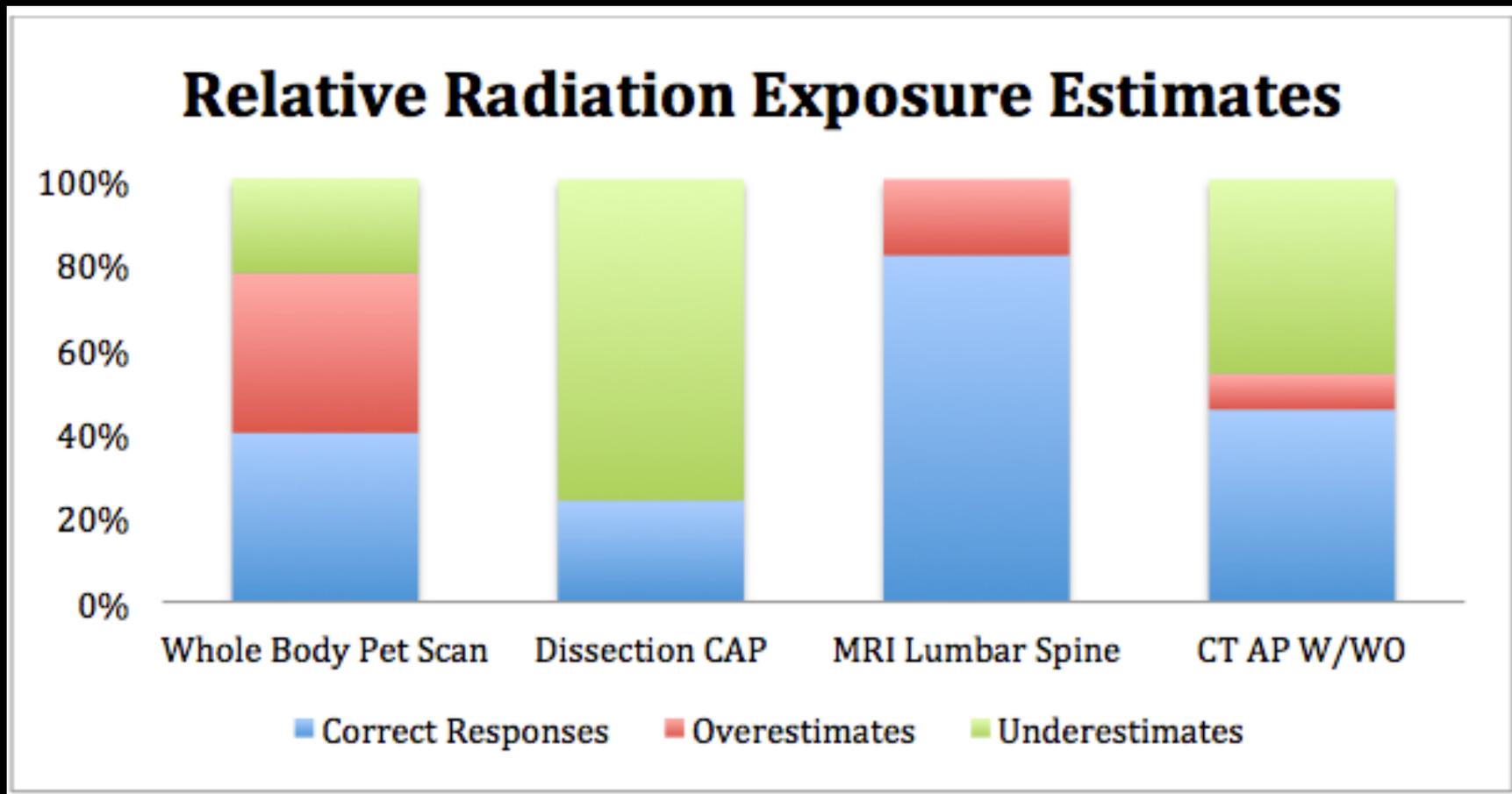


Figure 1:  
Respondents' Estimates of Relative Radiation Level

# Results

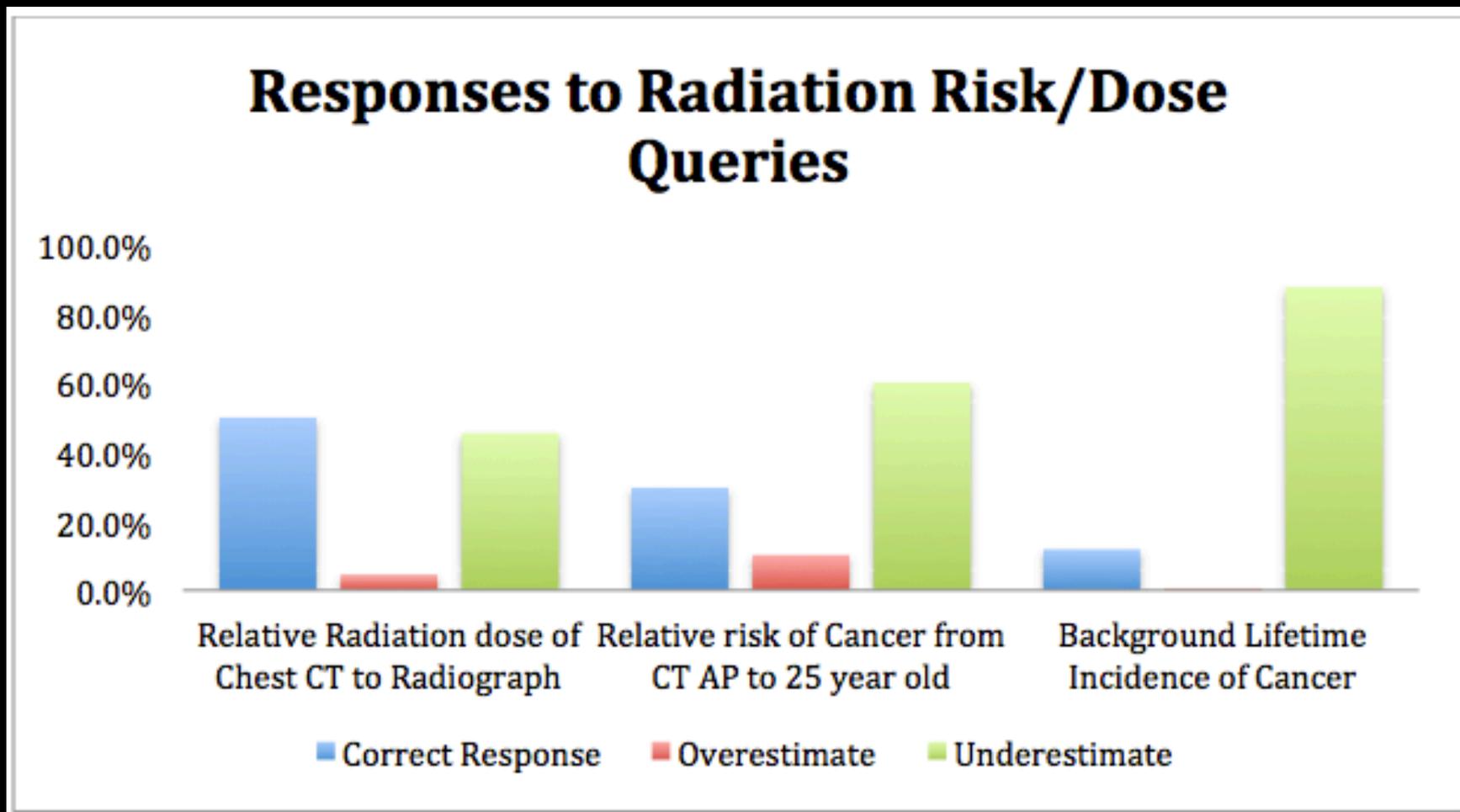


Figure 2:  
Responses to Radiation Risk Questions

## Results

- 47.8% (470/984) of radiation dose estimates across four commonly performed imaging studies were correct.
- 50% (123/246) of respondents correctly estimated the radiation dose of a chest CT relative to chest radiograph.
- 29.7% (73/246) correctly estimated the lifetime relative risk of a radiation induced malignancy for a 25 year old undergoing a CT abdomen pelvis.
- 31.3% (77/246) of respondents correctly chose the appropriate imaging exam to investigate pulmonary embolism in a pregnant patient.
- 11.8% (29/246) of respondents correctly estimated the background lifetime incidence of cancer in the United States.

## Limitations

- Single site survey
- Limited to physician trainees
- Potential for non-responder bias, given an overall completed response rate of 20%
- Risks of carcinogenesis related to radiation are controversial.
- While questions were written to emulate patient concerns, they may not accurately reflect the way clinicians counsel their patients regarding radiation safety.

## Conclusions

- Postgraduate physician trainees demonstrate a limited awareness of radiation safety, and may be unable to adequately address the concerns of their patients.
- Nearly half of trainees consider their radiation safety knowledge inadequate, and approximately two thirds desire more focused education.
- Targeted medical school education and integration of relative radiation dose information into clinical decision support tools / computerized order entry systems could help address this knowledge gap.

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