

# ***Radiation awareness among radiology residents, fellows, staff and technologists***



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# Disclosure Statement

- I do not have an affiliation, financial or otherwise, with a pharmaceutical company, medical device or communications organization.

# INTRODUCTION

- Medical radiation - greatest artificial source of radiation to the general population .
- 0.67 mSv/year in 1980 to over 3 mSv/year in 2005.
- 3 million CT in 1980 to 60 million scans in 2005.
- 30% of all CT scans are avoidable or manageable by alternative diagnostic tests.
- Primary concern is Cancer. Threshold not yet known.

# INTRODUCTION

- Review of English literature showed the knowledge of radiations doses and risks incurred in radiological examinations is very limited among both population and health care professionals.
- Many studies among physicians, interns and family practitioners .
- Surprisingly very few studies among radiologists.
- Overall these studies indicate limited knowledge of the medical professionals in radiation issues and are not competent enough to answer the common questions raised by patients.

# OBJECTIVES

To investigate and compare the level of knowledge among residents, fellows, staff and technologists of department of radiology regarding

- *Absolute effective dose and effective dose compared to chest x ray in common radiology examinations .*
- *Estimated risk of fatal cancer from common radiology examinations .*
- *Radiation exposure in pregnancy.*

# MATERIALS AND METHODS

20 questions on various topics like

- Annual natural background radiation
- Effective dose of single view CXR, CT abdomen.
- Dosage of 2 view CXR, AXR, CT abdomen, CT Head, mammogram in terms of equivalent chest x rays.
- Comparison of doses of barium enema and screening CT colonography
- Dosage from airport scanner in relation to CXR.
- Estimated risk of fatal cancer from common examinations
- How to manage radiation exposure in pregnancy
- Most sensitive organ and age group to radiation.

# MATERIALS AND METHODS

- Prospective cross-sectional study performed after REB approval.
- Multiple choice questionnaire containing 20 questions designed on online survey software tool.
- Distributed through Ottawa hospital group mailing list to all residents, fellows, staff and technologists in the department of medical imaging.
- Time limit of 2 weeks.
- Anonymous data collection except the level of training.
- Multiple choice format with four options.

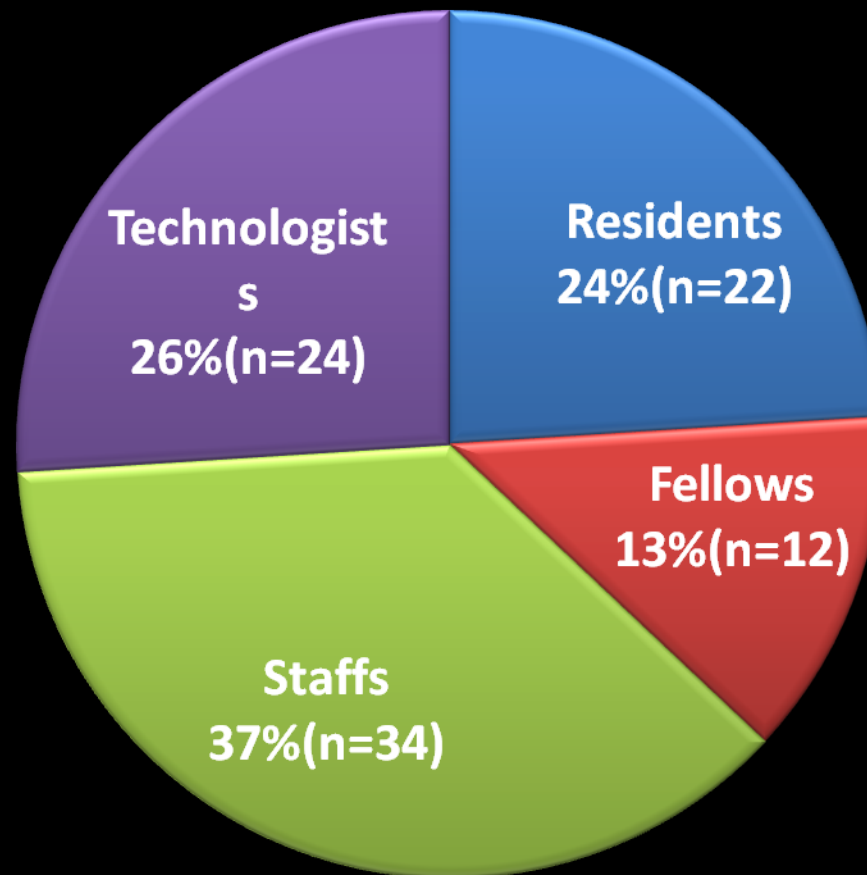
# STATISTICS

- SPSS version 17.
- Shapiro-Wilk test of normality
- Descriptive statistics.
- Chi-square tests of independence was used to analyse individual questions.
- Mann-Whitney and Kruskal-Wallis tests to compare the responses among groups.
- Statistical significance  $p < 0.05$



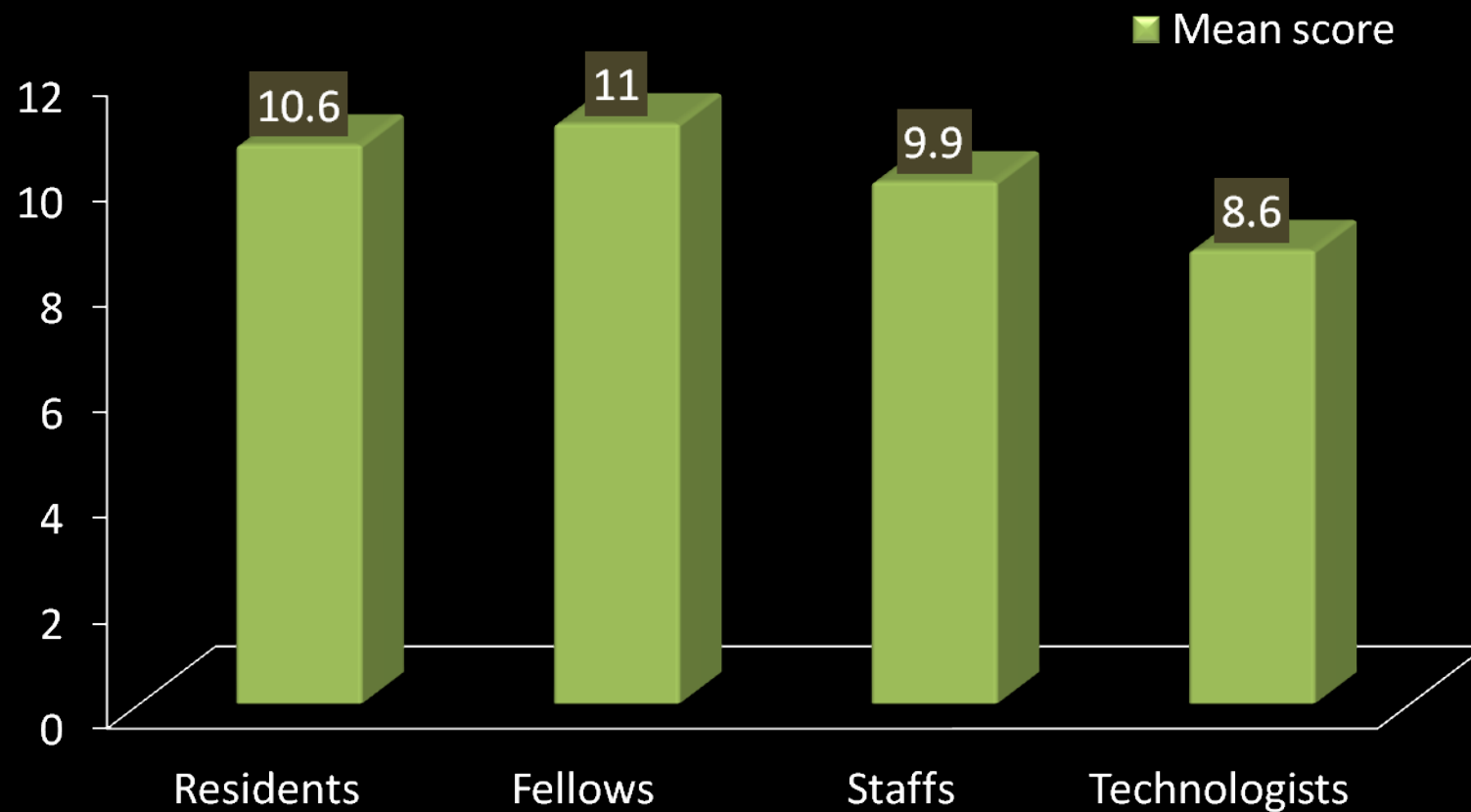
# RESULTS

- Total responders – 92



# MEAN SCORE

- Mean Score out of 20 = 9.9 +/- 2.7 SD.

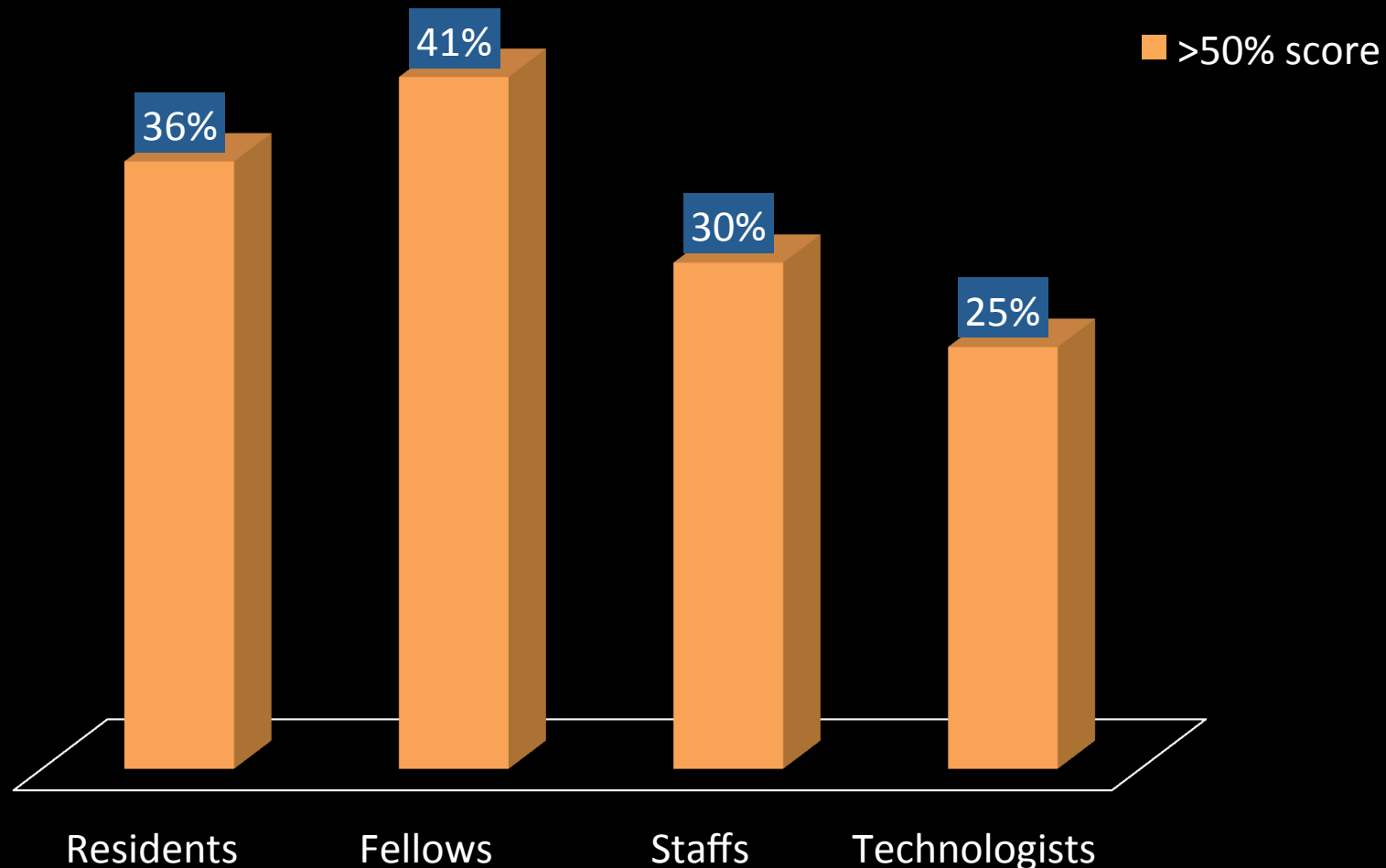


# MEAN SCORE

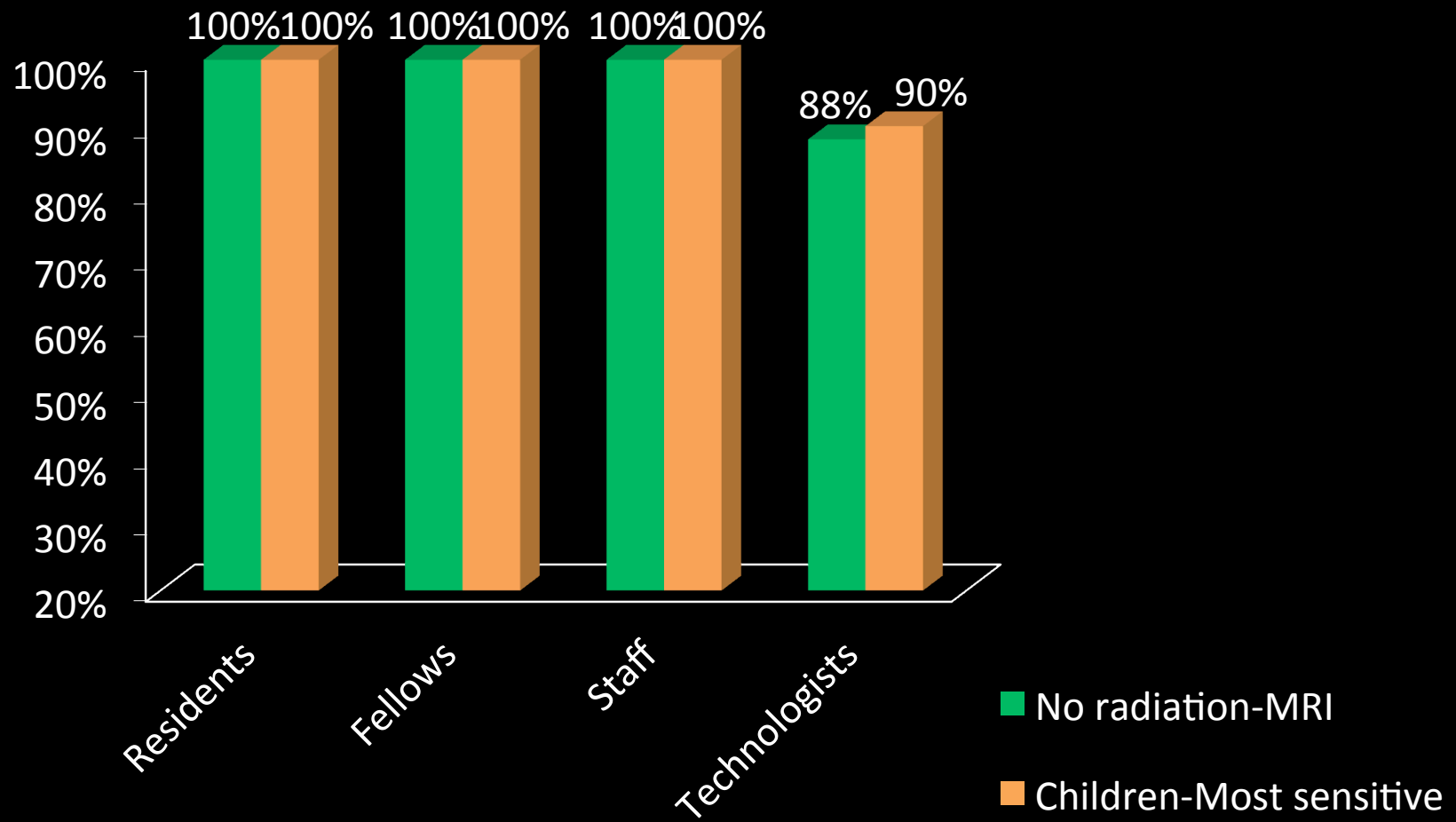
Comparison of mean score	P value
Resident Vs Fellow	0.54
Resident Vs Staff	0.154
Resident Vs Technologist	0.022
Fellow Vs Staff	0.33
Fellow Vs Technologist	0.034
Staff Vs Tech	0.135

## >50% SCORE

- Percentage of responders who scored >50% = 30% (n=27)

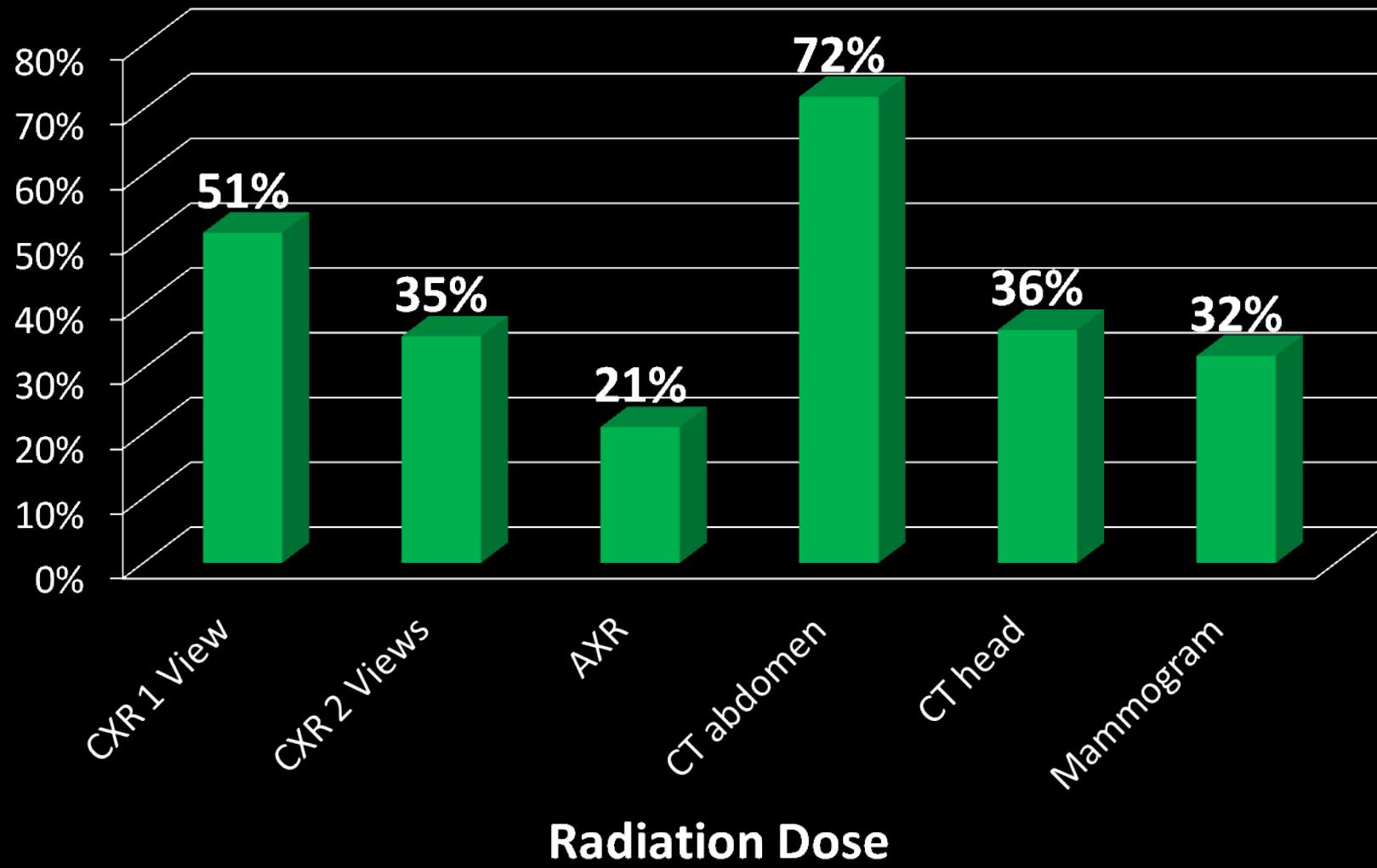


# >50% SCORE



# EFFECTIVE DOSE

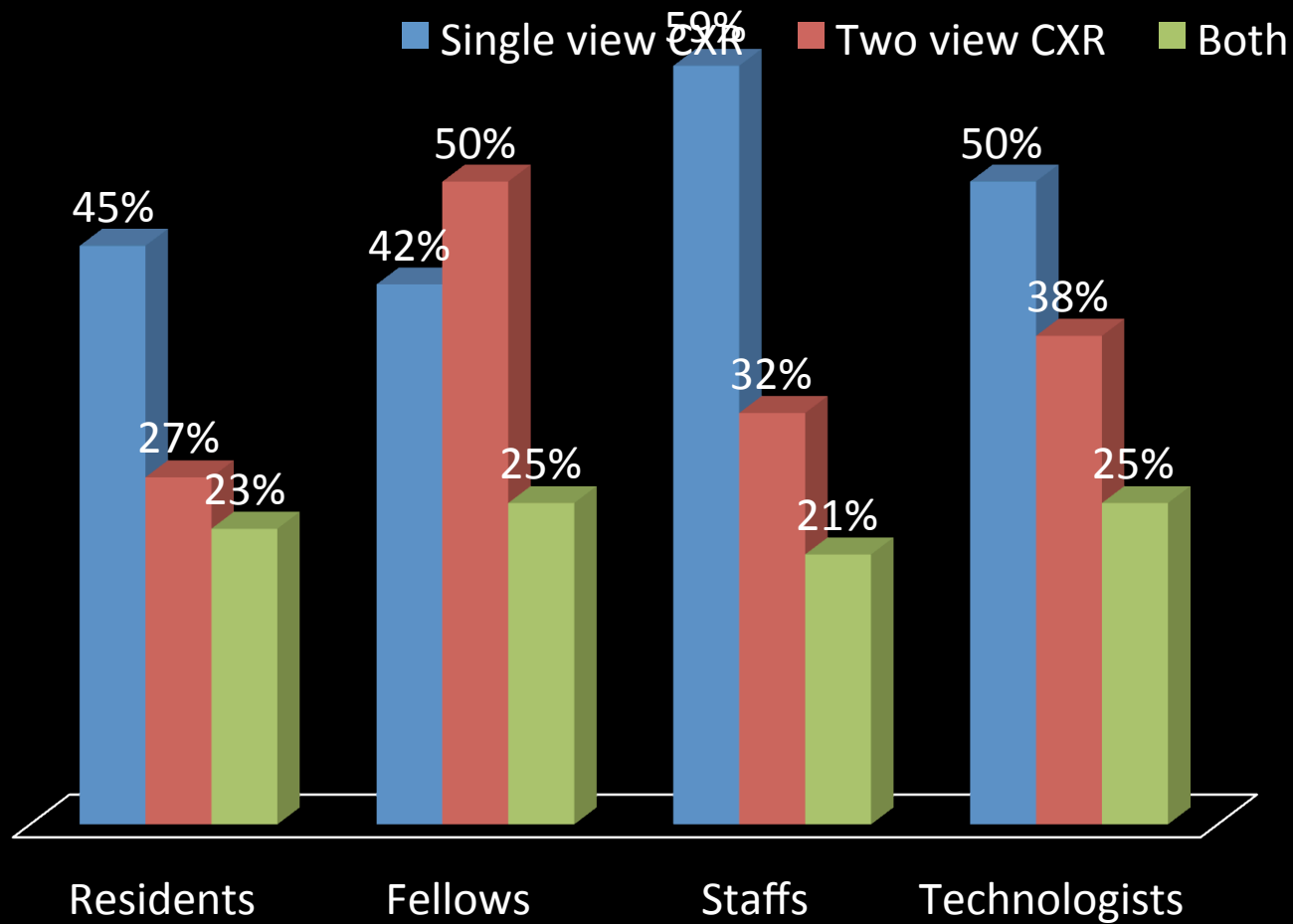
■ % of correct responses



# CHEST X RAY

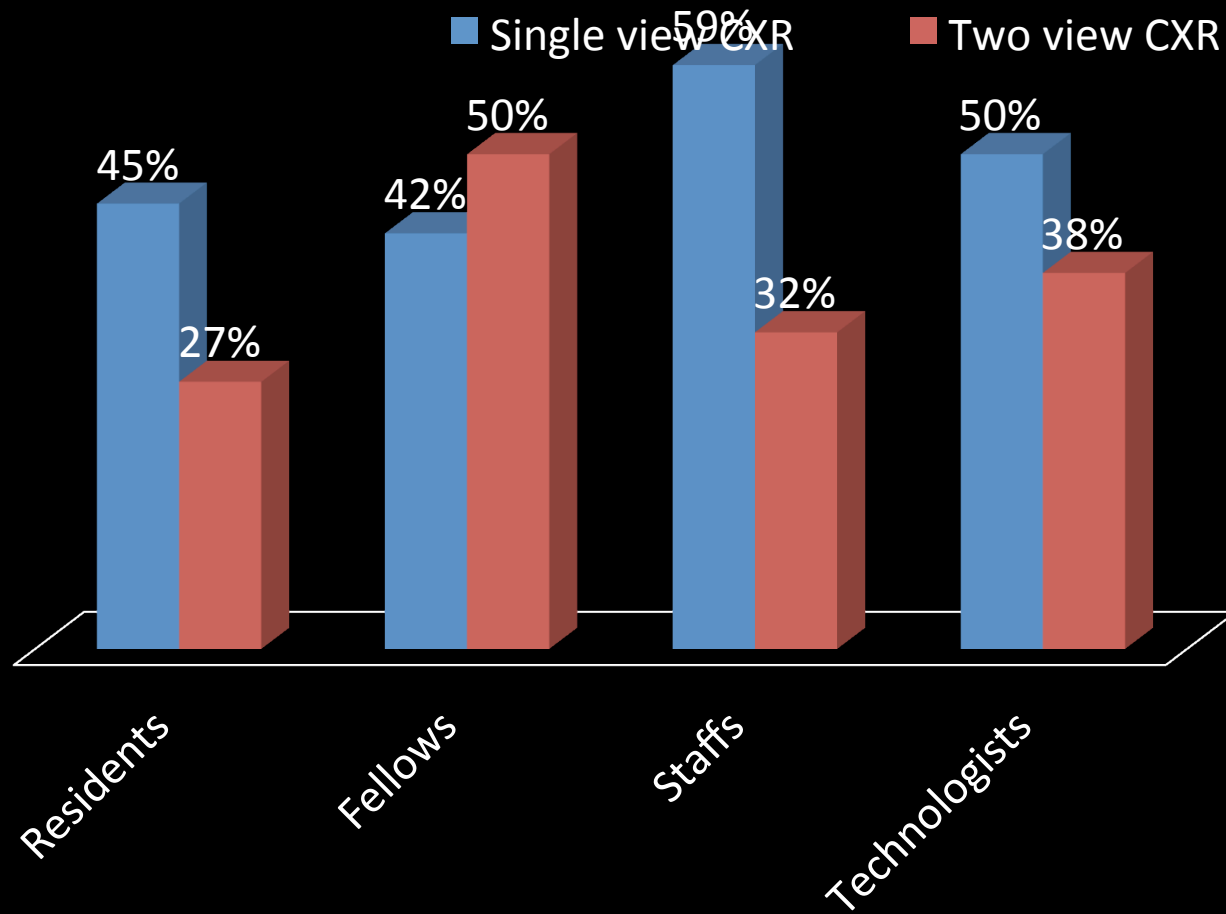
- Effective dose of single view CXR correctly answered by **51%(n=47)**
- Two view CXR by **35%(n=32)**
- Both correctly answered by only **23%(n=21)**

# CHEST X RAY

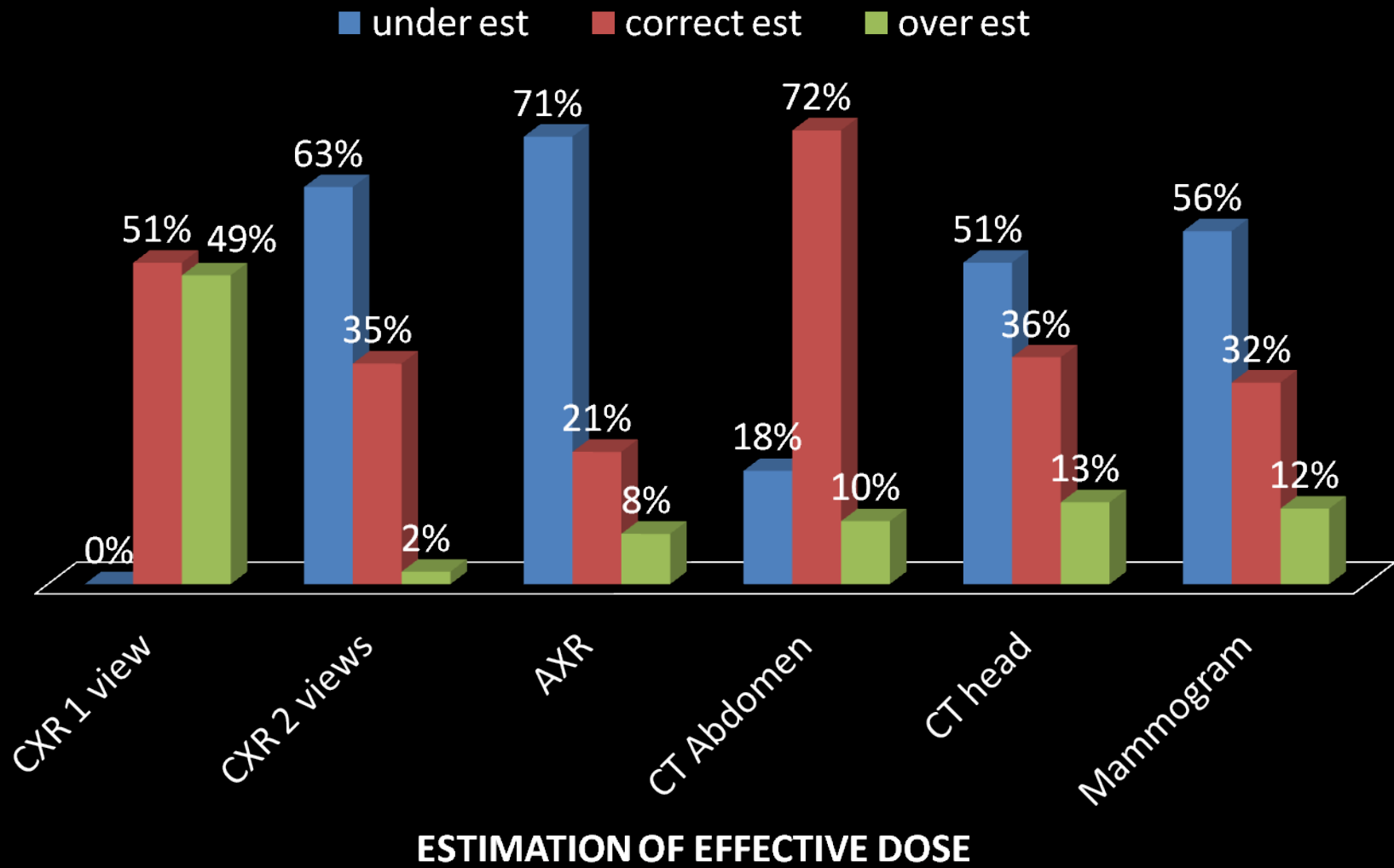




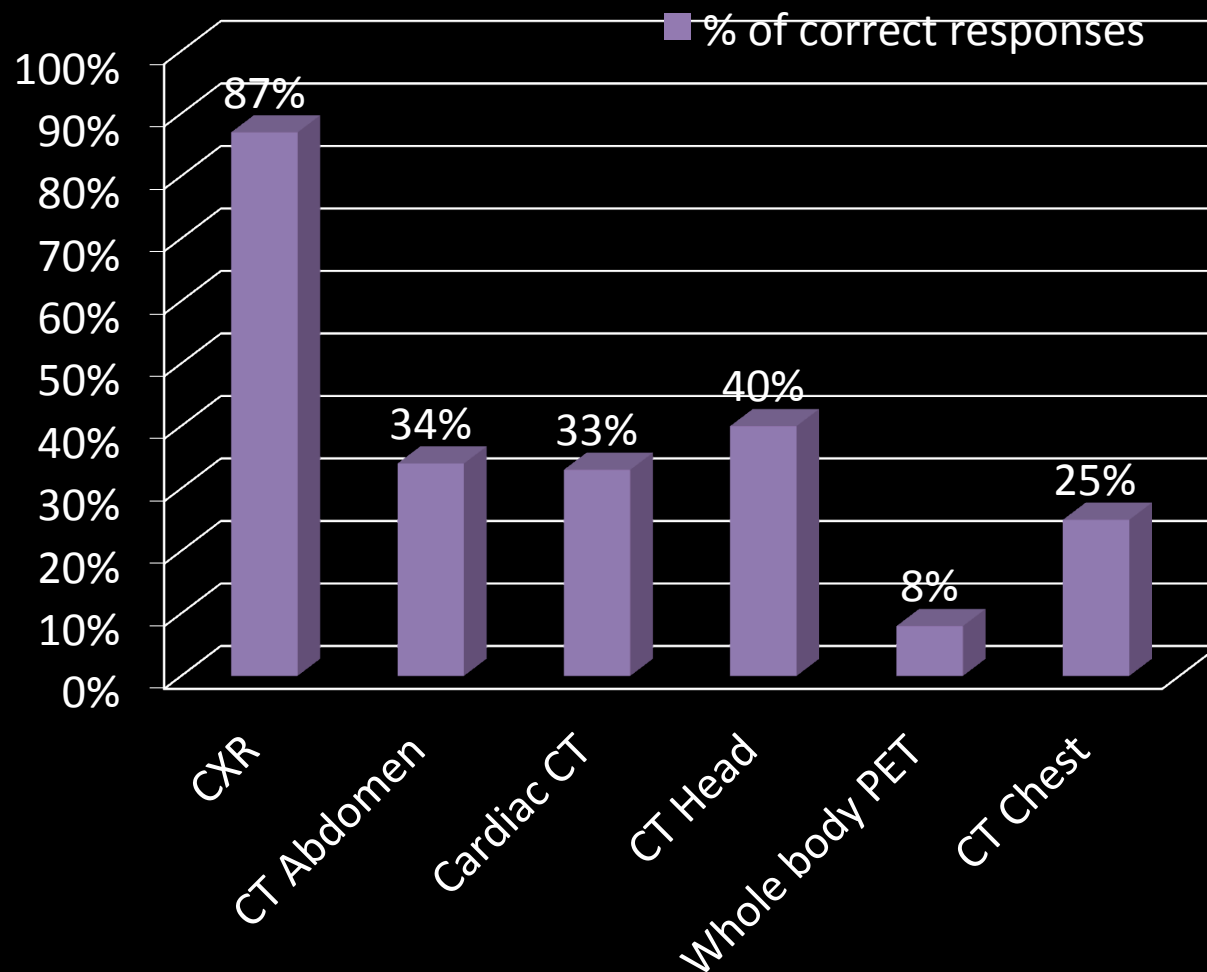
# CHEST X RAY



# UNDER AND OVER ESTIMATION OF EFFECTIVE DOSE

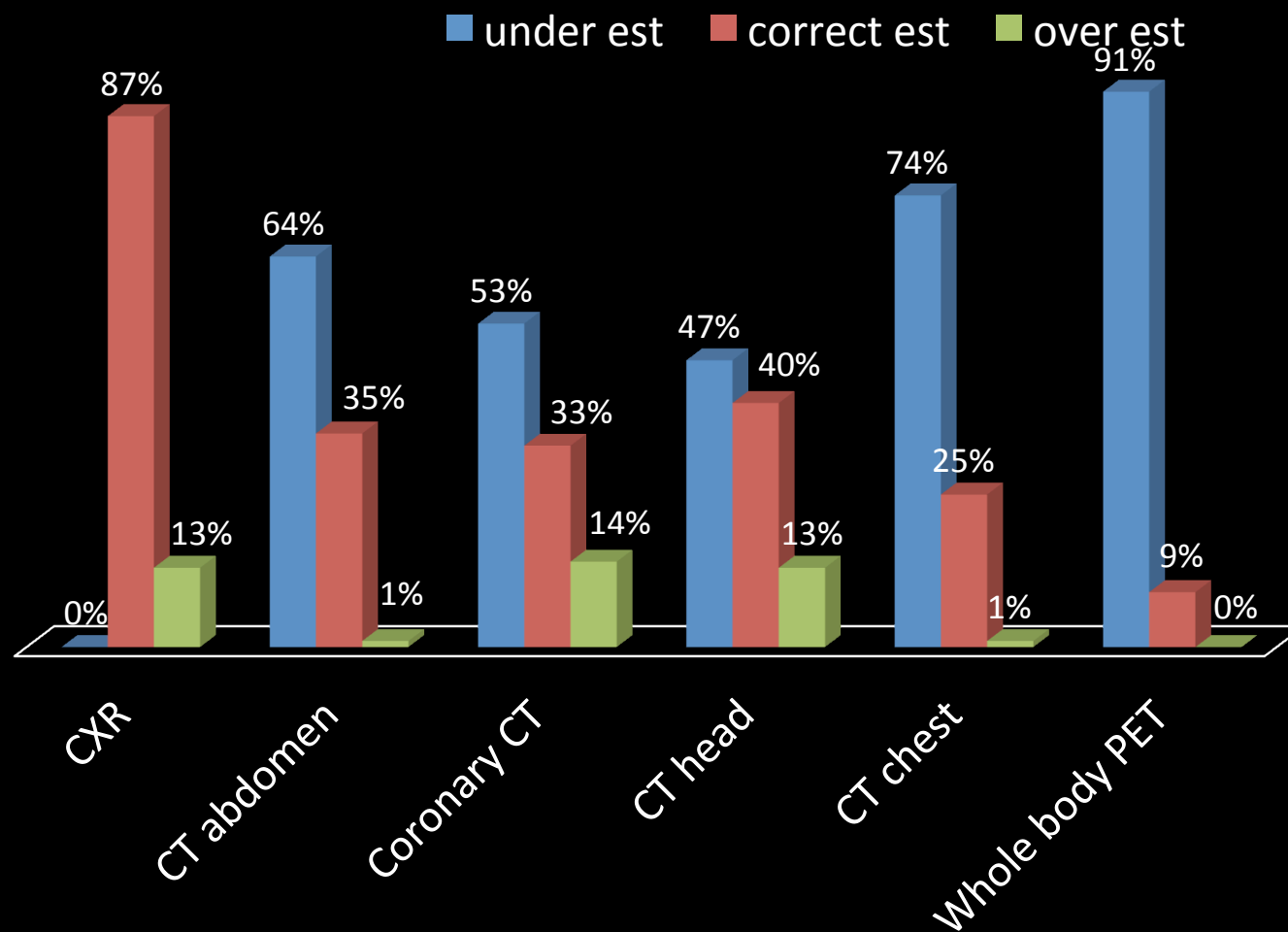


# RISK OF INDUCING FATAL CANCER



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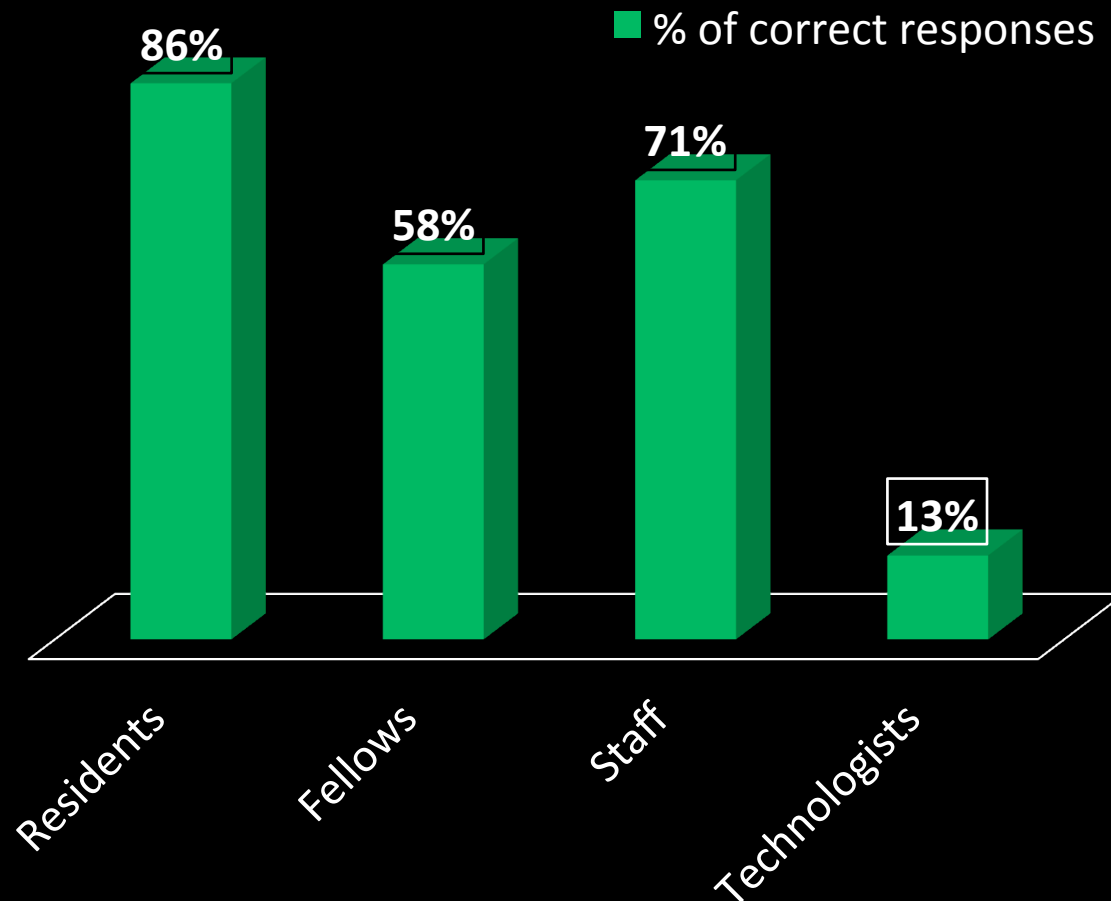


ESTIMATION OF CANCER RISK

# RADIATION EXPOSURE IN PREGNANCY

- A pregnant woman underwent CT abdomen and pelvis with contrast as her pregnancy status was not enquired by the CT technologist before performing CT. What should be the course of action according to ACR guidelines?
  - a. Reassure the mother that the risk to the fetus is negligible
  - b. Suggest medical termination of pregnancy as an option
  - c. Do genetic analysis by amniocentesis or chorionic villous biopsy
  - d. Do MRI of the fetus to look for CNS anomalies.

# RADIATION EXPOSURE IN PREGNANCY



- Residents, Fellows, Staff Vs Technologists  $p=0.001$

# RESULTS

- Overall this is the largest study among radiologists.
- Surprisingly only 3 studies so far included radiologists as a part of other specialities. None exclusively among radiologists.
- Results are difficult to compare and variable.
- Things haven't improved.
- Although the knowledge of radiologists in this study is better than non radiologists quoted in other studies (which is expected and required!), it is still significantly inadequate.

# RESULTS

Studies	CT dose in comparison to CXR	CXR effective dose
Lee et al, 2004 (Radiology)	13%	-
Soye et al, 2008 (BJR)	-	92%
Lee RK et al, 2012 (EMJ)	-	32%
Our study.	55%	51%



# SUMMARY

- Mean score is 9.9 out of 20.
- Only 30% scored more than 50%
- Only 55% are aware of dose from CXR
- 60-70% underestimate dose from common studies
- 50-70% underestimate the risk of fatal cancer
- Radiation awareness in pregnancy is variable and particularly poor among technologists.
- Overall significant knowledge gap in technologists.  
No statistical difference among residents, fellows and staff.

# CONCLUSION

- Physicians need to have adequate knowledge about radiation- Because they order the tests.
- However, it is the radiologists who are finally deciding on the appropriateness of the study for an individual patient.
- It is the duty of radiologists to answer the patient's concerns and at the same time to impart knowledge of radiation to their clinical colleagues. For that it is essential that, radiologists should have sufficient knowledge about common radiological exams and their possible risks to the patients.

# What is expected from us?

- Awareness about radiation is essential for technologists, as they are first point of contact for patients in most situations. They should be adequately trained to answer the patient's questions and concerns.
- Next level of contact is the residents and fellows who are expected to be experts in case the technologists could not completely alleviate patient's concerns and to give expert advice to their colleagues in other specialities.
- .Staff radiologists have the most important role of imparting the knowledge about radiation and any updates in the field to the technologists, residents and fellows periodically

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