

Impact of Education on Physician Attitudes Toward Computed Tomography Utilization and Consent (Article)

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Education

IMPACT OF EDUCATION ON PHYSICIAN ATTITUDES TOWARD COMPUTED TOMOGRAPHY UTILIZATION AND CONSENT

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Abstract—Background: There are risks to ordering computed tomography (CT) scans. **Objective:** We set out to determine whether emergency physician attitudes and their predictions of CT ordering behaviors could be influenced by education. **Methods:** We surveyed emergency physicians at a Level I trauma center with a yearly census of 74,000. Physicians were given a baseline survey that encompassed demographics, attitudes toward CT informed consent, and ordering behaviors. After receiving an education session regarding CT risks, each participant received a follow-up survey. Data analysis was performed using frequencies and chi-squared. **Results:** Seventy-five physicians participated; 69% residents and 31% attendings; 34% were female and 66% male. Thirteen percent reported they did not know if informed consent was required for CT scans obtained in the Emergency Department. Pre-education, 89% reported sometimes ordering a CT scan due to a consultant request that they felt was not indicated, and 92% reported that they sometimes ordered a CT scan to appease a patient or family. Eighty-five percent reported that they sometimes ordered a CT scan defensively due to malpractice risk. After education, physicians were more likely to believe a patient should give informed consent before CT ($p < 0.01$) and predicted that they would be more likely to discuss the risks/benefits of CT with their patients all of the time ($p = 0.001$). **Conclusion:** After education

about the risks of CT utilization, emergency physicians were more likely to believe that patients should give informed consent before CT scan and predicted that they would be more likely to discuss the risks and benefits of CT with their patients. © 2012 Elsevier Inc.

Keywords—CT consent; CT education; CT attitudes

INTRODUCTION

Due to its superior sensitivity for life-threatening pathology, computed tomography (CT) is the standard of care in the evaluation of a large portion of patient complaints in the emergency department (ED) (1). It is estimated that more than 62 million CT scans were performed in the United States in 2008, including at least four million on children (2). There is a strong case to be made that too many CT studies are being performed in the United States (3). In a 2004 survey of radiologists and emergency physicians, about 75% of the entire group significantly underestimated the radiation dose from a CT scan, and 53% of radiologists and 91% of emergency physicians did not believe that CT scans increased the lifetime risk of cancer (4). Yet in reality, there was a significant increase in the overall risk of cancer in the subgroup of atomic-bomb survivors who received low doses of radiation, ranging from 5 to 150 millisieverts (mSv) (5). Examples of routine ED testing and associated radiation dose

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Table 1. Examples of Routine ED Testing and Associated Radiation to Relevant Organ (Dose in mSv)

Background radiation (6)	0.0002 mSV
Chest X-ray (PA) (7)	0.02 mSV
Cervical spine X-ray series (6)	0.27 mSV
Thoracic spine (AP and lateral) (6)	1.4 mSV
Head CT (6)	2.0 mSV
Cervical spine CT (8)	2.9 mSV
Chest CT (7,9)	8.0–20 mSV
Abdomen/pelvis CT (8,9)	14.4–20 mSV

PA = posteroanterior; AP = anteroposterior; CT = computed tomography.

in mSv are highlighted in Table 1 (6–9). Although it seems ethical and prudent to inform the patient of this hazard before the study, explaining radiation to a layperson is not a simple task (1).

Though mathematically straightforward, the concepts of low-level radiation exposure and estimated excess relative risk of cancer induction are befuddling at the bedside. Many physicians simply summarize a radiation risk as “low,” which is arguably inadequate in a matter of cancer, where even low risk may be personally significant for a specific patient. Many physicians don’t discuss the risks of CT with their patients at all, as the practical challenge of communicating this topic deters them from entering into this detailed conversation (1). Although most academic medical centers currently have guidelines for informed consent regarding CT, only a minority of institutions inform patients about possible risks and alternatives to CT scans (10).

It is unclear what emergency physician attitudes exist regarding the need for informed consent when obtaining a CT in the ED. We set out to determine whether emergency physician attitudes toward informed consent and their predictions of CT ordering behaviors could be influenced by education.

METHODS

We surveyed a convenience sample cohort of emergency residents and attending physicians in the winter months of 2010 at a tertiary suburban, Level I trauma center with a yearly census of 74,000. The Emergency Medicine residency is accredited by both the American Osteopathic Association and the Accreditation Council for Graduate Medical Education, and has 56 residents in a 4-year program. There are 56 practicing attendings that serve this hospital, of which 25 were at sessions that made them eligible for participation. Institutional Review Board approval was obtained after expedited review.

Physicians were given a 24-item baseline survey that encompassed personal demographics, attitudes toward consent, knowledge of patient adverse reactions, and ordering behaviors, as well as attitudes or behaviors

towards consent. This was followed by a single, approximately 15-min Microsoft PowerPoint™ (Microsoft Corporation, Redmond, WA) presentation reviewing risks and complications of CT scans that was developed and delivered by members of the study team. The educational summary included information on risks of intravenous contrast and radiation. It covered contrast dye allergies, nephrotoxicity, impact on patients taking sulfonylureas, air embolus, and dye extravasation into tissues. The education session also included risk of single vs. repeated radiation exposure, as well as factors that affect this risk such as type of CT, and age of the patient at time of CT scan (see Figure 1 [online] for detailed presentation). Education was mandatory for those in attendance at the grand rounds and department meetings where presentations occurred. Attendance was tracked at these meetings, and no provider attended more than one session. Any emergency medicine resident or attending at these sessions could participate in the research survey, which was voluntary and anonymous for all respondents. Immediately after the presentation, participants received a matched follow-up nine-item survey, which was completed and returned in a sealed envelope with their baseline survey to a restricted access collection box. The survey format included yes-or-no and multiple-choice questions and was developed by the study team. The instrument underwent minimal changes after a content validity check was performed by five emergency physicians who were not a part of the study. Specifically, physicians estimated the number of scans they ordered per shift, the type of scan they most frequently ordered, the risk factors they considered before ordering a CT scan, and the influences that impacted the studies they ordered. Physician attitudes were measured regarding the need for informed consent before and after the educational session. Participants-linked baseline and post-education surveys were analyzed using SPSS version 18 (IBM Corporation, Armonk, NY). Cross-tabulations and the Student’s *t*-test were computed to examine the percent change in attitudes after the participation in the educational intervention. Chi-squared statistics were computed to examine the overall change in the distribution of the responses after participation in the intervention. Unless otherwise noted, only statistically significant differences at a .05 level or less are reported in the text.

RESULTS

Seventy-seven emergency physicians participated in the program. Two emergency physician surveys were deleted from the study due to missing data. Twenty-three of 25 eligible attendings and 52/56 eligible residents completed both surveys. Of the 75 physicians participating in the study, 69% (52/75) were residents and 31% (23/75)

Table 2. Selected Participant Demographic Characteristics

Demographic Characteristics	Percent
Level of training	
PGY1	19
PGY2	19
PGY3	16
PGY4	16
Attending	31
Age	
20–29 years	25
30–39 years	59
40–49 years	8
50–59 years	6
60+ years	1
Gender	
Female	35
Male	65
What type of CT scan do you order most frequently?	
Head	70
Abdomen/pelvis (contrast)	23
Abdomen/pelvis (no contrast)	7
For what chief complaint do you order CT scans the most?	
Trauma	57
Abdominal pain	39
Other	4
Is informed consent required for CT scans ordered from the Emergency Department?	
Yes	11
No	76
Don't know	13

PGY = post-graduate year; CT = computed tomography.

were attendings. Of those surveyed, 34% were females and 66% were male; 95% were white and 99% non-Hispanic. Additional demographics and survey responses can be found in [Table 2](#).

Ordering a CT scan in which an adverse event occurred was reported by 43% (32/75) of respondents. Notably, 13% of physicians (10/75) reported they did not know if informed consent was required for CT scans ordered from their ED.

Overall, participation in the educational activity resulted in a change in attitudes regarding whether physicians thought patients should give their informed consent before they got a CT scan in the ED. After education, physicians were 15% more likely to think that patients should give consent before they receive a CT scan in the ED ($p < 0.01$, 95% confidence interval [CI] 78–92%). Before education, there was no significant gender difference in attitudes toward patient consent. However, after education, female physicians were 26% more likely to think that patients should give their consent before they got a CT scan in the ED ($p < 0.001$, 95% CI 91–100%). There was a greater than fourfold increase (19%) in the percentage of physicians who predicted that they would verbally discuss with the patient or their representative the risk and benefits of having a CT scan done all of the time ($p = 0.001$, 95% CI 23–25%). Finally, there was a 50% reduction (from 30% to 15%, $p < 0.05$) in the percentage

of physicians who did not think that patients should give their informed consent before they got a CT scan.

Regarding participant predictions of CT-ordering behaviors, > 80% of those surveyed pre- and post-education reported that they considered a patient's renal function and age when ordering a CT most of the time. More than 60% reported (pre- and post-education) that they considered the number of previous CT scans a patient had before ordering a CT scan most of the time.

Pre-education, 89% (67/75) of physicians reported sometimes ordering CT due to a consultant request, even though they did not think it was indicated, and 92% (69/75) reported that they sometimes ordered CT to satisfy a patient or family request. A high number of subjects (85%, 64/75) reported that they sometimes ordered a CT scan defensively due to malpractice risk. Regardless of the receipt of the educational intervention, $\geq 85\%$ of the physicians reported each of the following: sometimes ordering a CT scan for fear of a malpractice risk, at a consultant's request that they felt was not indicated, or to appease a patient or a family member.

DISCUSSION

There is little existing emergency medicine literature and few studies similar to our own that address specifically what type of informed consent should be obtained before CT examinations, or whether it's even necessary. Our results indicate that emergency physicians are more likely to believe a patient should provide informed consent before CT scans after a brief educational presentation on CT risks. Future studies should evaluate from an ethical and practical standpoint what type of consent should be obtained (e.g., verbal vs. written, general treatment vs. specific to the CT). More than one of every eight physicians in our study did not know whether informed consent was required for CT scans that were ordered from their ED. Clearly, there is room for education in this regard irrespective of departmental policy changes as to the type of consent obtained.

Other variables like patient, family, and consultant demands as well as malpractice risk impact emergency physician ordering behaviors. Even after education, the preponderance of physicians anticipated that pressures from these sources could continue to influence the ordering of CT scans that they believe are unwarranted. Beyond education, other interventions such as public policy change, malpractice reform, and CT protocols may have a greater influence on physician practice.

Limitations

Several limitations deserve discussion. This study was performed at a single site in Pennsylvania and thus may

not be geographically generalizable. It is noted that the pre-test survey had 25 questions and the post had only nine. Therein, the survey itself may not have reliably or accurately measured what the authors set out to determine because there is a natural tendency to report the right thing; or in this case a social desirability bias to report considering CT risks more seriously after education.

Over half of our physician cohort consisted of residents, and the total sample size was not large enough to understand the unique influences that levels of experience or training might have on results. The residency at the medical center where the study took place recently became dually accredited by both the American Osteopathic Association and the Accreditation Council for Graduate Medical Education. Only two (4%) of the resident respondents to the survey were allopathic residents, the large majority of the respondents being osteopathic EM residents. Endeavors that included both academic and non-academic settings might detect additional unique results.

The presentation given was brief, averaging < 20 min and using a Microsoft PowerPoint format slideshow. It is unclear if the length or type of presentation had an affect on survey results. Likewise we did not evaluate for the long-term retention of the training.

Most importantly, our study focused on emergency physician *predicted* attitude change and *anticipated* ordering behaviors for CT scans. Actual ordering behaviors of the surveyed physicians before and after education about adverse risks of CT scans were not assessed. Further evaluation is needed to determine if education impacts actual ordering behaviors of physicians or the provision of informed consent. Additionally, female physicians were more likely to anticipate a change in their ordering habits after the education session. This demographic variable may influence the type of intervention chosen to impact physician consenting and ordering behaviors and needs to be carefully evaluated as a potential confounder in future studies.

CONCLUSION

Overall, participation in an educational activity regarding potential risks of CT resulted in changes in attitude in this

cohort of physicians. After the session, emergency physicians were significantly more likely to believe that patients should give informed consent before CT scan obtained from the ED. Additionally, education influenced physician predictions that they would be significantly more likely to verbally discuss the risks and benefits of CT with their patients all the time.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at doi:10.1016/j.jemermed.2011.09.005

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ARTICLE SUMMARY

1. Why is this topic important?

There is increasing concern that too many unnecessary CTs or non-indicated CTs are being performed.

2. What does this study attempt to show?

The study attempts to determine whether emergency physician attitudes and their predictions of CT ordering behaviors can be influenced by brief educational interventions.

3. What are the key findings?

After education about the risks of CT utilization, emergency physicians were more likely to believe that patients should give informed consent before CT scan.

4. How is patient care impacted?

After education, emergency physicians predicted that they would be more likely to discuss the risks and benefits of CT with their patients.