The Journal of Emergency Medicine, Vol. 46, No. 2, pp. 208–214, 2014

0736-4679/$ - see front matter

ELSEVIER

http://dx.doi.org/10.1016/j.jemermed.2013.07.016

Selected Topics: Emergency Radiology

EMERGENCY DEPARTMENT PATIENT KNOWLEDGE, OPINIONS, AND RISK TOLERANCE REGARDING COMPUTED TOMOGRAPHY SCAN RADIATION

Nadine A. Youssef, MD,* Andrew J. Gordon, BA,† Timothy H. Moon, BS,† Bharvi D. Patel,* Sharan J. Shah,* Erin M. Casey,* Andrew J. McGowan, BA,* and Scott G. Weiner, MD, MPH*

*Department of Emergency Medicine, Tufts Medical Center, Boston, Massachusetts and †Tufts University School of Medicine, Boston, Massachusetts

Reprint Address: Scott G. Weiner, MD, MPH, Department of Emergency Medicine, Tufts Medical Center, 800 Washington Street, Box 311, Boston, MA 02111

☐ **Abstract—Background: Computed tomography (CT) scanning use for emergency department (ED) patients has increased exponentially since its inception. Study Objectives: This study aimed to determine what patients view as the risk of radiation from CT scans, their risk tolerance and preference for alternative testing, and their opinions about informed consent and malpractice regarding CT scans. Methods: A 25-question survey was administered to a random convenience sample of ED patients aged ≥ 18 years by trained research associates. Results: There were 487 patients approached to be surveyed; 78 patients were excluded, leaving 409 patients (84.0%) responding. Mean patient age was 40.5 (standard deviation [SD] 16.8) years, and 51.5% were female. Three hundred ninety of 409 (95.4%) believed doctors should explain the risks and benefits of CT, and 316/409 (77.3%) thought an informed consent form should be signed. One hundred seventy-nine of 409 (43.8%) patients recognized that there was more radiation from a CT scan than a single chest x-ray study. Three hundred twenty-four of 409 (79.2%) preferred CT angiography over lumbar puncture to exclude subarachnoid hemorrhage. To diagnose appendicitis, 199/409 (48.7%) preferred an ultrasound first even if it meant needing a subsequent confirmatory CT, and 193/409 (47.2%) preferred a CT right away. One hundred sixty-nine of 409 (41.3%) patients would still like to have a CT scan of the head after head trauma even if their physician did not believe the test was indicated. Conclusion: This study elucidates patient preference and knowledge regarding CT scans. Overall, patients have a poor understanding of CT scan radiation, and desire to have risks explained to them as informed consent prior to the scan.** © **2014 Elsevier Inc.**

☐ **Keywords—computed tomography; radiation; patient knowledge; informed consent; risk tolerance; emergency medicine**

INTRODUCTION

Computed tomography (CT) use has grown to more than 70 million CT scans per year in the United States (1). As a result, it was estimated that CT use was responsible for 49% of the medically related radiation exposure to the general population in the United States in 2006, up from 3% in the early 1980s (2). CT radiation exposure has been described as a potential future public health issue, with estimates that CT use in the United States in 2007 will cause 29,000 cancers (1,3).

In the emergency department (ED) specifically, the use of CT scans in the diagnosis and management of patients has also increased exponentially over the past 20 years. Studies demonstrate that CT use during ED visits grew 330% between 1996 and 2007, from 3.2% of encounters in 1996, to 13.9% of all encounters in

RECEIVED: 21 February 2013; FINAL SUBMISSION RECEIVED: 24 May 2013;
ACCEPTED: 21 July 2013

2007 (4). This rate of rise occurred higher in the ED than in other care settings (5). It is likely that as CT technology advances and indications expand, utilization will continue to remain substantial. The CT utilization rate for patients seen in the ED was found to be 16.7% for adult patients, and as high as 27.8% for patients admitted to the hospital (6). As expected with this trend, per capita radiation dose is also increasing. In a study of enrollees in six large health systems, mean patient radiation dose increased from 1.2 mSv in 1996 to 2.3 mSv in 2010, and by 2010, 10.7% of enrollees had annual doses >20 mSv (7).

Although it is clear that there is important clinical utility to CT, and the benefits likely outweigh the risks of not performing scans, with about 1 in 7 ED patients receiving a CT scan, it is imperative that patients are fully aware of their radiation risks when undergoing the test. It is not known what patients currently perceive is the risk of CTs and their desire for consent and shared decision-making prior to CT. The primary end point of this study was to determine, via survey methodology, what a cross-section of urban ED patients viewed as the risk of radiation from CT scans. As secondary end points, we aimed to gauge patient risk tolerance and preference for alternative testing and to determine opinions about informed consent and malpractice involving CT scans.

METHODS

Study Design

This study was a cross-sectional survey of adult ED patients to determine their knowledge about CT scan radiation, their opinions about informed consent prior to CT, and their risk tolerance with regard to various clinical scenarios. Patients were not compensated for their participation in this study. The study was granted exempt status by our medical center's institutional review board.

Study Setting and Population

The study was conducted at an urban academic medical center ED seeing approximately 42,000 visits per year. A convenience sample of patients was surveyed between June and August 2011.

Study Protocol

Patients aged 18 years and older who were registered in the ED for any complaint were eligible for inclusion. We aimed to determine the opinions of the general ED population and not just those who were to receive a CT scan. Patients were excluded if they were deemed by the clinical staff to be of high acuity or in distress (e.g., clinically unstable or in excessive pain), did not speak English, had altered mental status, were alleged victims of sexual assault, had acute psychiatric illness, or were prisoners. A 25-question multiple choice survey was administered to a random sample of patients (Appendix 1).

Trained research associates (RAs) administered the survey in a standardized fashion during all days of the week and at different times of the day. We approached the process with an "intent-to-survey" methodology. The RA selected each patient from the ED electronic tracking system prior to knowing if they met inclusion or exclusion criteria. A de-identified record of all patients that were deemed ineligible was kept and the reason for exclusion was noted. Survey completion was voluntary, and once verbal consent to participate was obtained, the RA administered the survey and recorded patient responses. Patients were surveyed in their ED bed space at some point during the course of their clinical evaluation.

Measurements

The survey was created by the research team, asking questions and clinical scenarios that were of interest to us. The survey was informally trialed to several nonmedical personnel to determine ease of comprehension, but was not otherwise validated. There were five sections in the survey. Section A asked patients whether they thought physicians should explain the risks of x-ray studies and CT scans and obtain written informed consent prior to ordering a CT scan. Section B ascertained patient knowledge of the amount of radiation involved in a CT scan as compared to plain radiographs and the potential risk of future cancer related to those exposures. Section C asked patients to choose between CT scans and other diagnostic or treatment options in three specific clinical scenarios. Section D asked patients to report their number of previous CT scans and whether, to the best of their knowledge, they were having a CT scan during the index ED visit. Finally, section E inquired about demographic information including age, gender, race, type of insurance coverage, and access to a primary care practitioner. Visit characteristics including time of day, day of the week, and assigned Emergency Severity Index (ESI) triage score were also recorded (8).

Data Analysis

Survey results were recorded in written format and then transferred by hand to Microsoft Excel (Microsoft Corporation, Redmond, WA). Manual data transfer was performed by an RA and then double-checked by a second investigator. JMP 8 (SAS Institute, Inc, Cary, NC) was used for descriptive statistical analysis.