

Clinical Science

The prevalence and impact of defensive medicine in the radiographic workup of the trauma patient: a pilot study



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Abstract

BACKGROUND: Defensive medicine is estimated to cost the United States \$210 billion annually. Trauma surgeons are at risk of practicing defensive medicine in the form of reflexively ordering computed tomography (CT) scans. The aim of this study is to quantify the monetary impact and radiation exposure related to the radiographic workup of trauma patients.

METHODS: We conducted a prospective, observational study involving 295 trauma patients at Level I trauma center. Physicians were surveyed regarding specific CT scans ordered, likelihood of significant injuries found on scans, and which scans would have been ordered in a hypothetical, litigation-free environment.

RESULTS: Four hundred sixteen of 1,097 CT scans (38%) were ordered out of defensive purposes. Nine CT scans (2.2%) that would not have been ordered resulted in a change in management. Defensively ordered CT scans resulted in nearly \$120,000 in excess charges and 8.8 mSv of unnecessary radiation per patient.

CONCLUSION: Defensively ordered CT scan in the workup of trauma patients is a prevalent and costly practice that exposes patients to potentially unnecessary and harmful radiation.

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Recently, the issue of healthcare reform has dominated political rhetoric, and for good reason. The United States' healthcare system is the most expensive in the world.¹ In 2011, national healthcare spending reached \$2.7 trillion, equivalent to \$8,680 per capita, representing 17.9% of our gross domestic product. According to the Centers for Medicare and Medicaid Services, the expected growth of

National Health Care Expenditures for 2014 is 6.1%. By 2022, healthcare spending is projected to be 19.9% of gross domestic product.²

Additionally, a significant discordance between US healthcare spending and US healthcare outcomes exists. Despite the staggering amount of monetary resources funneled into healthcare expenditures, the United States ranks 36th in life expectancy and has the third highest infant mortality rate in the world.³

Wasteful spending in the US health system has been estimated to be up to \$1.2 trillion, essentially half of all healthcare dollars. Many healthcare reformists and physicians argue that defensive medicine, in the form of ordering treatments, tests, and procedures primarily to protect the physician from liability rather than furthering patient diagnosis and care, is a major contributor to wasteful healthcare spending. Although opponents argue that tort reform would not significantly help to contain costs, it is difficult to ignore the estimated \$210 billion spent annually on defensive medicine.^{3,4}

The costs of unnecessary imaging comprise a significant portion of the defensive medicine bill. The dramatic rise in the use of computed tomography (CT) scans is of particular concern. Between the years 1996 and 2007, emergency department visits increased 30%, while CT use increased 330% during the same time period.⁵ Not only are these studies expensive, they also expose patients to potentially unnecessary amounts of harmful radiation. A 2007 study from Columbia University estimated that 1.5% to 2.0% of all cancers in the United States could be attributed to radiation from CT scans.⁶

The question of whether physicians practice defensively in the form of overordering radiologic studies has been well described in recent literature. A survey involving 1,028 members of the American Association of Neurosurgeons found that 72% of neurosurgeons engaged in defensive medicine practices by ordering additional imaging studies.⁷ A 2010 survey of 1,214 orthopedic traumatologists found that 23% of all CT scans were ordered for defensive purposes.⁸

These studies are relevant as they highlight how pervasive defensive medicine has become the practice of medicine today. However, there is a paucity of objective, nonsurvey data to characterize the full impact of practicing defensive medicine. The aim of this study was to (1) determine the prevalence of potentially unnecessary radiographic studies performed on trauma patients, (2) determine the rate of significant injuries on studies deemed to be unnecessary, (3) quantify the amount of radiation that patients receive as a result of potentially unnecessary radiographic studies, and (4) determine an estimated monetary impact of performing potentially unnecessary radiographic studies.

Methods

We conducted a prospective, observational study of trauma surgeon behavior with respect to the CT workup

of trauma activation patients at a single Level I trauma center between June and October 2012. Following initial Advanced Trauma Life Support resuscitative protocols, attending surgeons completed the surveys asking the following: (1) what specific CT scans were ordered, (2) the likelihood that a given study would yield at least one clinically significant positive result (measured on a scale from 0 to 10), and (3) in a litigation-free environment, guided only by clinical judgment, which CT scans would have been ordered.

Completion of the survey was required after CT scans were ordered, but “before” the CT scans were performed and results revealed. All CT findings were reviewed and deemed to be significant or not by 2 independent physicians, 1 trauma surgeon, and 1 emergency medicine physician, each of whom was blinded to the others’ decision. In general, significant injuries included any intracranial blood, any acute fracture seen on any study, or intrathoracic or intra-abdominal injury. Soft tissue injuries were generally not considered significant. Cohen’s kappa was used to assess the agreement between the 2 raters.

We tested whether the rate of significant findings depended on the motivation for ordering the CT scan (clinical vs defensive purposes) using Fisher’s exact test.

Chart reviews were conducted to investigate if a significant finding detected on CT scans ordered for defensive purposes resulted in changes in management of the patient.

Medicare reimbursement rates were used to estimate the monetary impact of obtaining potentially unnecessary CT scans. The Medicare reimbursement rates reflect the price for the procedure, radiologist’s interpretation fee, and contrast, if applicable. Patients transferred from another institution with CT scans already performed were excluded from analysis, as were patients in whom CT scans were not ordered. Additionally, pregnant patients and children were also excluded from analysis.

All CT scans were performed on a Toshiba Aquilion TSX 101A, 320-slice scanner, calibrated to operate at 160 slices. Radiation exposures for specific scans were used to calculate total radiation exposure and radiation exposure per patient.

Results

During the study period, 1,097 CT scans were performed on 295 trauma activation patients, for an average of 3.7 scans per patient. The most commonly ordered CT scans were cervical spine ($n = 243$), followed by brain ($n = 204$), abdomen/pelvis ($n = 150$), thoracic spine ($n = 148$), lumbar spine ($n = 140$), chest ($n = 121$), maxillary/face ($n = 73$), and neck angiography ($n = 18$). In total, 416 (38%) CT scans were ordered for defensive purposes (Table 1). The CT scan most frequently ordered for defensive purposes was CT chest (51%), followed by lumbar spine (48%), thoracic spine (45%), cervical spine (41%), neck angiography (39%), abdomen/pelvis (34%), brain (24%), and maxillary/face (21%).

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