Original Investigation

The Impact of a Preauthorization Policy on the After-hours Utilization of Emergency Department Computed Tomography Imaging

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Rationale and Objectives: We evaluated the effects of a streamlined emergency department (ED) policy for CT ordering, pre- and postimplementation, on the completed imaging study rates of all after-hours computed tomography (CT) studies. The study hypothesis was that a streamlined CT ordering process would increase the utilization rates of ED CT.

Materials and Methods: A prospective cohort study was used to estimate the effect of enhancing a preauthorization policy for after-hours CT studies requested through the ED, performed between January 1 and June 30, 2013, and the postimplementation period, performed between January 1 and June 30, 2014. Inclusion criteria were all CT chest, CT abdomen/pelvis, musculoskeletal, neurological, and neuroangiographic examinations performed by ED physicians on adult patients. Pre- and postintervention examination imaging study rates were compared.

Results: The period following implementation of the preauthorization policy was associated with a statistically significant increase in utilization for most subtypes of CT examinations (CT chest, CT abdomen/pelvis, and musculoskeletal CT studies), with the exception of neurological examinations, which showed a significant decrease.

Conclusions: This study demonstrates a trend toward increased utilization of CT resources after implementation of an ED preauthorization policy with most study types showing significantly increased utilization. In the case of neurological examinations, a potential "substitution effect" was observed, whereby the rates of neuroangiographic studies showed a marked increase, offsetting the decrease in general neurological examinations performed. Departments considering implementation of preauthorization policies should weigh carefully the benefits of ED workflow efficiencies against the potential harms of increased CT use.

Key Words: Tomography; x-ray computed; emergency service; hospital.

BACKGROUND

Numerous North American healthcare system stakeholders have expressed concern about emergency department (ED) overutilization of imaging studies, particularly computed tomography (CT) imaging. A number of hypotheses have been raised as to the factors that may lead to overutilization (1–5) including incorporation of a CT scanner within an ED (6). Inappropriate imaging use may be associated with rising costs of health care as well as increased lifetime risk of cancer, and it has been suggested by several authors that increased imaging resource use may not lead to improved patient outcomes (7,8). Results of certain studies have suggested that, given considerable ED inter-physician variability in the use of specific CT study types, a standardized approach to ordering CT studies is recommended, ideally including a straightforward policy for ED physicians during the imaging examination order process (9).

Our center created a streamlined CT examination ordering policy that was implemented in the belief that it would improve ease of CT ordering to decrease ED patient turnaround times. The hypothesis is that a streamlined ordering process for all commonly requested CT ED studies should decrease the length of stay for ED patients who require one of those CT examinations included within the policy. Other centers have experimented with the implementation of ED decision support systems in an effort to decrease the use of unnecessary imaging with either equivocal or mixed results when there were fewer limitations placed on imaging resource availability (10).

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Study Objective

To evaluate the effect of change to a streamlined ED CT ordering policy on ED CT utilization in a tertiary care hospital and a community hospital.

METHODS

Study Design, Data Collection, Setting, and Participants

This is a multicenter, prospective cohort study in EDs of two Canadian public hospitals. Of note, the 39 ED physicians who were study eligible in the two hospitals were all cross-appointed and shared equivalent shifts between the two sites.

Recruitment of patients commenced on January 1, 2013 and ended on June 30, 2014. Two separate data collection intervals were utilized. The first was prior to the streamlined ordering policy implementation between January 1 and June 30, 2013. The second interval was after the policy implementation date of November 1, 2013, which is between January 1 and June 30, 2014. The date ranges were intentionally selected to avoid seasonal variation in the volumes of CT requests. The data were collected from the hospital information technology database, which describes the date of image request and the type of CT study being performed. Two separate data queries were done: one for each study interval before and after the policy change. The hospital organization information technology system was queried and the date were collected within Excel files (Microsoft Corporation, Redmond, WA).

Prior to this policy, the institution did not require real-time radiology approval for the following studies: trauma CTs, renal colic CT, noncontrast head CT, and noncontrast cervical spine CT. All other CT studies required a conversation, typically a telephone call, between the emergency physician and the radiologist to proceed with the study. Upon implementation of the streamlined ordering policy, the following studies were included: CT pulmonary angiogram, CT carotid and circle of Willis angiograms, any combination of CT chest and abdominal/pelvis/lower extremity angiograms, noncontrast CT chest, CT facial bones, CT orbits, CT head with and without contrast, CT lumbar spine, CT temporal bones, and CT bony pelvis.

Our inclusion criteria were all adult (≥17 years) CT examinations requested by ER physicians during the study period. The CT examinations were grouped into three groups, namely neuroimaging, chest/body imaging, and musculoskeletal imaging (Table 1). The CTs selected were only ED CTs requested by emergency physicians. Research ethics approval was obtained through the healthcare institution.

The CTs requested from new staff emergency physicians who started working anytime after January 1, 2014 and staff emergency physicians who retired during the data collection intervals were excluded from the study. This was to ensure consistency of the pre- and postintervention cohorts by having them consist of patients managed by the same emergency physicians.

TABLE 1. Imaging Study Subtypes Included Within Each CT Examination Category

Study Category	Study Subtypes Included
Neuroimaging*	CT head with or without contrast, CT carotid arteries, CT circle of Willis, CT facial bones with and without contrast, CT spine, CT orbits, and CT paranasal sinuses
Neuroangiography	CT carotids and CT circle of Willis angiogram
Thorax, abdomen, pelvis**	CT pulmonary embolism, CT chest/abdomen/pelvis with or without contrast, CT chest with or without contrast, and CT pelvis with contrast
Thorax, abdomen, pelvis angiography	CT arterial angiogram, abdominal angiograms, thoracic angiograms, and arterial runoff examinations (including upper and lower extremities)
Musculoskeletal imaging	CT any joint and CT bony pelvis

CT, computed tomography.
* Neurological imaging excludes any angiographic imaging.
** Thorax, abdomen, and pelvis CT imaging excludes any angiographic imaging.

The ED physician was required to check a box on a CT ED requisition to select any of the included types of CT studies. The new ED policy was introduced to these hospitals in November 2013 and was followed by a 2-month grace period to allow the ED clinicians to adapt to the policy change. The study estimated the difference in the proportion of examinations performed under the preintervention policy of radiologist approval in the 6-month period from January 1, 2013 to June 30, 2013, as compared to the 6-month period after the policy change to streamlined ED ordering, from January 1, 2014 to June 30, 2014.

Statistical Methods

The examinations were grouped into five categories and we used the chi-square test to assess for differences in proportions of examinations performed between the pre- and the postintervention periods. We also calculated the 95% confidence intervals (CIs) of the proportion of examinations performed within each of these two periods.

RESULTS

During the pre- and postintervention periods, 6753 and 6529 CT examinations were performed, respectively. The largest proportion of examinations performed during both periods were neuro/trauma CT (56.3% of all examinations performed). Overall, there was a significant difference in