How frequently does head CT affect decision making in the emergency setting?

Abstract  Objective: To determine the overall frequency with which head computed tomography (HCT) affects decision-making in emergency department (ED) patients overall and on the basis of specific clinical findings and indications. Methods: Staff requesting HCT scans from the ED prospectively completed a form detailing patient complaints, selected history and physical findings, and likely disposition based upon clinical findings. After completion of the HCT, the clinician reported whether the HCT scan affected therapy and in what way. Results: Of a total 567 patient-visits from June 9, 1999 through September 7, 2000, HCT altered therapy 22% of the time. The most frequent alterations in care as a result of the CT were: medications withheld or given, indwelling shunt adjustment, and alteration in stroke protocol. A significant number of patients in all risk categories had their care altered. There was a correlation between physicians’ pre-HCT assessment of the likelihood that HCT would affect emergency care and the frequency that HCT did alter care. Conclusions: A high rate of unexpected therapy and disposition changes occurred on the basis of HCT in all risk categories of ED patients. History and physical data were good predictors of the utility of this study.

Keywords  Head computed tomography – Emergency – Decision-making – Clinical guidelines

Introduction
Many studies have evaluated the usefulness of emergency head computed tomography (HCT) for a variety of clinical problems [1, 2, 3]. No set of guidelines has had perfect sensitivity for detecting pathology while defining a population that does not require acute imaging. HCT has been cited as an expensive test which frequently yields normal results. The exposure of the patient to ionizing radiation is another argument against its overuse. In addition to these considerations, the mere presence of abnormality in a test does not establish that the test was indicated; nor does a normal result imply that the test should not have been ordered. A significant consideration is the perceived unforgiving nature of the American public and tort system, with its implication for zero tolerance for error. In a survey of Canadian emergency physicians, more than half insisted that a clinical decision rule for minor head injury must have a sensitivity of 100% for identifying lesions necessitating neurosurgical intervention, and 9% required that any clinical decision rule be 100% sensitive for identifying any acute lesion [4].

Our purpose was to determine the frequency with which the performance of HCT alters therapy or disposition in a predominantly nontrauma environment. The primary goal was to determine the frequency of alteration of therapy in the emergency department (ED) based upon specific clinical indications. Secondarily, the study was to determine whether emergency physicians could accurately predict on the basis of clinical findings whether the HCT would alter emergency care in any way.

Materials and methods
Cases were collected from the ED of a tertiary care facility that treats approximately 54,000 patients per year. It is not a trauma center. Data were compiled from July, 1999 through June, 2000. Clinicians filled out a form before obtaining the HCT. Each HCT form had boxes to check for HCT scan indication, and the ordering
physician could check as many boxes as were applicable for any given patient (Fig. 1). Prior to the performance of HCT, the physicians had to document their estimate on a scale from 1 to 10 as to whether there would be any abnormality at all on the HCT. They were also required to indicate the likelihood on a scale from 1 to 10 that the scan would show any abnormality which would alter emergency therapy or disposition.

Data entered on the form included the clinical indication for the HCT, stratified by high-, medium-, and low-risk criteria for finding abnormalities on the HCT scan. The form was developed jointly by the Departments of Neurology, Neurosurgery, Emergency Medicine, and Radiology. This was specifically not an attempt to determine whether CT scan was indicated. Any provider could order an HCT on a patient by calling for the study; they simply filled out the form checking off indications and findings. The forms were completed anonymously.

Results were analyzed as to whether care was affected by prior risk stratification. There was space for documenting independent history and physical findings (Fig. 1): for example, presence of fever, anticoagulant use, or focal deficit. If a patient met several risk criteria for scan, results were analyzed placing the patient into the highest category checked. For each indication, a 95% confidence interval (CI) was calculated for the proportion of patients whose management was changed by HCT. When the number of patients with a particular indication was less than 100, the binomial distribution was used to construct CIs. When the sample size was 100 or greater, asymptotic CIs were constructed.

Throughout the analysis, we were not so much concerned with whether a scan was abnormal as with whether the scan affected therapy. In fact, the presence of a normal CT scan may affect emergency care, as for stroke protocol or clearance for lumbar puncture in cases of suspected subarachnoid hemorrhage or brain abscess. Logistic regression was used to assess the relationship between physicians’ reported likelihood of finding a new abnormality and the presence/absence of an effect on management due to HCT.

This study was approved by the Institutional Review Board.

Fig. 1 From which staff physicians completed, including indication for HCT, likelihood of change in management, and how management was altered.