In the second study in this issue, Schabath et al10 sought to examine the relationship between dietary intake of phytoestrogens and the risk of developing lung cancer. Phytoestrogens are plant-derived nonsteroidal compounds; are found in soy products, grains, carrots, spinach, broccoli, and other fruits and vegetables; have weak estrogen-like activity; and have been shown to have a protective effect against other solid tumors.10,11 In their case-control study involving 1674 patients with lung cancer matched with 1735 healthy controls, the authors found a dose-response relationship showing reduction of lung cancer risk with higher intake of phytoestrogens. The highest dietary intake of phytoestrogens was associated with a relative risk reduction of 46% for lung cancer, with comparable effects in both men and women. The protective effects of high phytoestrogen intake were seen in current smokers but were less apparent in former smokers. However, the relative protective effects were greatest for individuals who had never smoked. While this group has a very low baseline risk of lung cancer, even that risk can be further reduced by dietary choices.

Physicians and other health care professionals should do all they can to help their patients who smoke reduce their risk of getting lung cancer. Total discontinuation of smoking, no matter the age of the patient, will provide the greatest benefit. The most effective interventions to achieve permanent smoking cessation combine pharmacological therapy and referral for intensive behavioral support from a trained counselor. Those patients who cannot quit smoking despite all efforts should be strongly encouraged to cut down on their cigarette consumption as much as possible, since doing so will significantly decrease their risk of lung cancer. Finally, patients should be informed that they may further reduce their risk of developing cancer by adopting a diet rich in fruits and vegetables. Clinicians who actively and aggressively educate their patients and follow up on their efforts to modify their cancer risks will help lessen the great personal suffering and societal burden inflicted by lung cancer.

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REFERENCES

Clinical Decision Instruments for CT Scanning in Minor Head Injury

Micelle J. Haydel, MD

Approximately 1 million patients with minor head injury are evaluated in US emergency departments and primary care offices annually.1 Less than 10% of patients with a normal level of consciousness after minor head trauma have intracranial injury and less than 1% require neurosurgical intervention.3-5 The goal of identifying the few patients with intracranial injury after minor head trauma has led to 2 approaches to computed tomography (CT) use in the United States: routinely scanning all patients with head trauma and loss of consciousness or reliance on clinical judgment to guide in CT use. Routine scanning results in large health care expenditures, whereas reliance on clinical judgment could reduce CT use, but at the cost of missing 20% of patients with intracranial injury.6,7

The authors of 2 well-publicized clinical decision instruments hoped to identify criteria to guide in CT use for patients with minor head injury.8,9 The New Orleans Criteria (NOC) study was undertaken in the United States, where clinicians have been criticized for overutilizing ubiquitous CT scanners.3 The Canadian CT Head Rule (CCHR) study was undertaken in Canada, where only 30% of acute care hospitals had a CT scanner at the time of the study.3 The

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goal of the NOC study was to identify patients who could safely forgo scanning, whereas the goal of the CCHR was to identify patients who were injured enough to benefit from scanning.

The NOC study was limited to patients with a normal Glasgow Coma Scale (GCS) score of 15, whereas the CCHR also included those patients with an abnormal GCS score (score, 13-15). The GCS score uses clinical findings to classify a patient’s level of consciousness; patients with an abnormal GCS score have significantly higher rates of intracranial injury than those with a normal GCS score. Many authors argue that patients with an abnormal GCS score should not be considered in the same group as those with a normal GCS score. In the United States, physicians routinely obtain CT scans for patients with an abnormal GCS score. The higher acuity of patients in the CCHR study was apparent; no patients died in the NOC study, while 4 patients in the CCHR study died secondary to head injury.

The primary outcome measures of the 2 studies were also substantially different. The NOC study used any acute intracranial injury on CT scan as the primary outcome measure, whereas the CCHR used neurosurgical intervention. A secondary outcome measure of the CCHR was “clinically important” intracranial injuries, although in the United States any intracranial injury is considered important, warranting 24-hour observation. The authors of the CCHR argued that small solitary cerebral contusions, small subarachnoid bleeds, small subdural hematomas, and isolated pneumocephaly were not clinically important because these lesions typically do not require neurosurgical intervention.

The results of the NOC study showed that CT use could be avoided in patients with minor head injury in the absence of all of the following: headache, emesis, older than 60 years, drug or alcohol intoxication, posttraumatic seizure, physical evidence of trauma above the clavicles, and short-term memory deficits. Implementing the NOC would have reduced CT use by an estimated 23% and would have identified 100% of patients with intracranial injury. The CCHR study found that CT use was indicated in patients if they failed to reach a GCS score of 15 within 2 hours of injury, had a suspected open skull fracture, signs of basilar skull fracture, vomiting more than once, or older than 64 years. Implementing the CCHR would have reduced CT use by an estimated 68% and would have identified 100% of patients who required neurosurgical intervention. To identify patients with any “clinically important” brain injury, the CCHR added 2 criteria: amnesia for the period before injury of more than 30 minutes and dangerous mechanism of injury. Using all 7 criteria would have reduced CT use by an estimated 49% and would have identified 98% of patients with “clinically important” injuries.

There have been several responses following the initial publication of the 2 decision instruments. In 2002, the American College of Emergency Physicians endorsed the NOC as an acceptable clinical policy. In 2003, the National Health Service adopted guidelines based on the CCHR that directed CT use in patients with minor head injury in the United Kingdom’s public hospitals. Despite these endorsements, neither of these decision instruments has been widely accepted in the United States.

In this issue of JAMA, 2 studies compare and validate the 2 decision instruments. The study by Smits et al was performed in 3181 patients with mild head trauma in the Netherlands and found both the NOC and CCHR to be 100% sensitive in identifying patients requiring neurosurgical intervention. The NOC was 98% to 99% sensitive in identifying patients with any intracranial injury on CT scan, whereas the CCHR was 83% to 87% sensitive. The reduced sensitivity may have been due to the authors’ inclusion of linear skull fractures in their primary outcome measure, which was not part of the outcome measures in either of the original studies. This study also found the specificity of the CCHR to be lower than expected but the specificity of the NOC was extremely low. This is likely due to the inclusion criteria requiring patients with a normal GCS score to have at least 1 of a group of risk factors that included all 7 NOC items.

The study by Stiell et al was performed in 2707 patients with head injury in Canada, using the same inclusion criteria and outcome measures as the original CCHR study. As expected, the study by Stiell et al found that the CCHR had similar sensitivities and specificities to that reported in their original study. Both the NOC and the CCHR identified 100% of patients who required neurosurgical intervention and 100% of patients with “clinically important” injuries on CT scan. The NOC also identified 99% of all patients with any intracranial injury, whereas the CCHR identified 93% of those patients. The specificity of the NOC in the study by Stiell et al was 12%, which was lower than the 22% reported in the original NOC study but is likely due to the significant differences in the inclusion criteria and outcome measures used in the 2 studies.

The difficulty in implementing any clinical decision instrument is in achieving physician confidence in the tool. Although the 2 studies in this issue of JAMA validate the instruments in different settings, the critical clinical issue is whether either decision instrument should be widely used in the United States or Canada. Widespread application of the CCHR could certainly reduce CT scan use but at the cost of missing intracranial injuries that Stiell et al label “clinically unimportant.” Many physicians find the idea of any “missed” intracranial injuries unacceptable, and a recent study of patients with intracranial injuries, similar to the injuries labeled unimportant in the CCHR studies, substantiated this concern by finding that 12% of such patients required neurosurgical intervention or had poor neurosurgical outcomes. Unfortunately, concern of litigation plays an additional role in medical decision making; a recent survey
found that 93% of physicians reported at least occasional defensive medicine practices.19

Widespread implementation of the NOC by physicians in the United States who routinely scan all patients with traumatic loss of consciousness would decrease CT use by 12% to 22%, while identifying 99% to 100% of patients with any intracranial injury.8,16 Even a 10% to 20% reduction in CT use would be advantageous in the setting of an overcrowded emergency department with long queues for the CT scanner, as well as in smaller hospitals in which the CT technician must be called in, or in a primary care setting where patients are transferred to a hospital for CT scanning. It has been estimated that a 20% reduction in CT scans in Canada’s 200,000 patients with minor head injury would save more than $3.5 million in health care dollars annually; whereas in the United States, a similar reduction in CT use in the 1 million patients with minor head injury would be expected to save more than $17 million in national health care dollars annually.

When a physician chooses to use a decision instrument, even one that approaches 100% sensitivity, it is important to remember that no test is perfect in all settings or all patient populations. For example, due to inclusion criteria in the original studies, the CCHR cannot be applied to patients with posttraumatic seizures, and neither instrument can be applied to patients with anticoagulation. Physicians should be aware that decision instruments are not constant; they must be revised as new data become available. For example, patients without loss of consciousness were excluded from both of the original studies, but Smits et al17 reported that 30% of patients requiring neurosurgical intervention reportedly had no documented or observed loss of consciousness. This finding has been anecdotally reported in the literature and illustrates an important point. When clinical suspicion is high, further testing is indicated, regardless of the results of a decision instrument. Finally, with all decision instruments, use of the word “rule” should be avoided, because it implies infallibility. Although both the CCHR and NOC approach 100% sensitivity for their respective outcome measures, it is up to the individual physician to determine if a clinical decision instrument is applicable to the individual patient and particular setting.

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REFERENCES