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Study Identifies Which Children Do Not Need CT Scans After Head Trauma

Research provides new guidelines to identify children with mild injuries and reduce radiation exposure from CT

SACRAMENTO, CA...A substantial percentage of children who get computed tomography (CT) scans after head trauma do not need them, and as a result are put at increased risk of cancer due to radiation exposure. After analyzing more than 42,000 children with head trauma, a national research team led by two UC Davis emergency medicine physicians has developed guidelines for doctors who care for children with head trauma. Their findings appear in today's issue of [*The Lancet*](#).

Researchers found that one in five children older than age two and nearly one-quarter of those younger than two who received CT scans following a head trauma did not need the scan because they were at very low risk of having serious brain injuries. In these low-risk children, the risk of developing cancer due to radiation exposure outweighed the risk of serious brain injury.

For years, studies have suggested that CT scans were being overused to rule out traumatic brain injuries. However, those studies were considered too small to be applicable to the general population. The current study, which was conducted through the [Pediatric Emergency Care Applied Research Network](#) (PECARN), enabled researchers to study large numbers of children, in a variety of settings, and from diverse populations through the network's [25 participating hospitals](#). Combined, PECARN hospitals see nearly 1 million children per year.

“When you have a sample size this large, it is easier to get close to the truth,” said Nathan Kuppermann, MD, MPH, professor and chair of emergency medicine, professor of pediatrics, and lead author of the study. “Our investigation provides the best available evidence regarding

the use of CT scans in children with head trauma, and it indicates that CT use can be safely reduced by eliminating its application in those children who are at very low risk of serious brain injuries.”

As part of the study, Kuppermann and his colleagues developed a set of rules for identifying low-risk patients. The “prediction rules” for children younger than two and for those older than two depend on the presence or absence of various symptoms and circumstances. For example, children younger than two who fell into the low-risk group showed normal mental status; no scalp swelling (except on the forehead); no significant loss of consciousness; no palpable skull fracture; and, according to the child’s caregiver, displayed normal behavior patterns. In addition, these children had an injury that was sustained in a non-severe way. (Severe accidents included motor vehicle crashes in which the patient was ejected and bicycle accidents involving automobiles in which the patient was not wearing a helmet.)

Key indicators for children older than two years who were at low-risk for brain injury included normal mental status, no loss of consciousness, no vomiting, no signs of skull fracture of the base of skull, and no severe headache. These children also did not sustain the injury in a serious accident.

To create the prediction rules, PECARN investigators studied outcomes in more than 42,000 children with minor initial symptoms and signs of head trauma. CT scans were performed in nearly 15,000 of those cases. Serious brain injuries were diagnosed in 376 children, and 60 children underwent neurosurgery.

The researchers then validated these rules by applying them to data from a second population of more than 8,600 children. In 99.9 percent of the cases, the rules accurately predicted children who were not diagnosed with serious brain injuries.

“Approximately 435,000 children younger than 14 years visit the emergency department each year to be evaluated for traumatic brain injury,” said James Holmes, MD, MPH, professor of emergency medicine at UC Davis School of Medicine and a co-author of the report. “Until now,

physicians have relied mostly on instincts when deciding if a child with head trauma warrants the use of a CT. Now we have reliable data based on large and validated research to assist in the decision making process.”

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The [Emergency Medical Services for Children Program](#) and the [Research Program](#) of the Maternal and Child Health Bureau, Health Resources and Services Administration, U.S. Department of Health and Human Services co-funded the study “Childhood Head Trauma: A Neuroimaging Decision Rule.”

PECARN is the first federally-funded, multi-institutional network for research in pediatric emergency medicine in the nation. The network conducts research into the prevention and management of acute illnesses and injuries in children and youth across the continuum of emergency medicine and health care.