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A Synopsis of The American Academy of Pediatrics' Practice Parameter on the Management of Minor Closed Head Injury in Children

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This article provides a summary of the practice parameter on closed head injury. The reader is urged to refer to the original document for a more thorough presentation.¹

sure the mother and retire to the hallway to contemplate your next step.

Case Presentation

Your next appointment is a "work in" of a 3-year-old child who sustained an apparently isolated head injury 2 hours ago while playing on the slide at a local playground. The child has been in your practice since birth and, other than treatment for two ear infections, has been healthy and has had no apparent underlying diseases. The injury was observed by his mother, a particularly fastidious, caring person, who indicates that after a period of 30 to 60 seconds, during which the child appeared lethargic, quiet, and poorly responsive to her, he cried and appeared somewhat fearful, finally responding to her questions appropriately and asking for a drink of water. On the way to the office, he vomited in the car, but has remained attentive and alert. You are concerned about the brief loss of consciousness that is suggested by the history. Your examination reveals a lump on the scalp, no laceration, and no evidence of other apparent injury beyond the head. Results of a careful neurologic examination are unremarkable, including mental status for age and funduscopic examination. You reas-

Minor Head Injury: A Common Problem With Significant Variations in Clinical Care Provided

In the United States, head trauma in children is common and a frequent reason for visits to the doctor's office. Over the past 2 decades, more than 300,000 children have visited the doctor annually for a recent head injury, and nearly one third of these visits have ended with the child being hospitalized.^{2,3} For a seemingly simple, straightforward problem, surveys reveal significant variations in care for minor, closed head injury, as suggested by findings from a sample of pediatricians, family physicians, and emergency physicians regarding current management for minor head injury without loss of consciousness (LOC).⁴ A total of 72% of respondents recommended observation at home; 11% recommended observation in the office or hospital; 4% recommended ordering some type of imaging test (1% computed tomographic [CT] scanning and 3% skull radiographs); and 13% suggested initially consulting with a neurologist, then observation in the hospital initially, followed by observation at home.

If brief LOC (<1 min) is noted, 58% of physicians would alter their actions, with 18% ordering CT, 2% skull radiographs, and 1% magnetic resonance imaging (MRI), and 21% opting for inpatient observation and 19% for CT plus inpatient observation. Although minor head injury is common, consensus among generalists for the best care for children who have isolated minor head injury is lacking.

Evidence-based Management: Practice Parameter Development

To develop recommendations based on the best available evidence and the experience of experts and practicing physicians, the American Academy of Pediatrics and the American Academy of Family Physicians convened a subcommittee to develop a practice parameter (this term is used interchangeably here with practice guideline) for the clinical management of minor, closed head injury in children. The case presentation around which the parameter was designed essentially mirrored the case presented here—a child of either gender, 2 through 20 years of age, who has an isolated, minor closed head injury. The child may have had, by history, actual or suspected momentary LOC or a short-lived impact seizure. Brief lethargy or the presence of headache or vomiting may be included. The history was negative for any underlying chronic disease or condition. The case presentation did not arouse warranted suspicion of nonaccidental injury (child abuse).

In reviewing the available literature and recorded experience, the Subcommittee examined 422 articles, 64 of which were found suitable for review. The selected articles and reports fit the established criteria of the Subcommittee for pertinence to the case definition and contained satisfactory scientific methodology. While developing the practice parameter, the Subcommittee attempted to create recommendations that defined "best practice." However, at many points, adequate data were not available from the medical literature to provide a single recommendation (guideline) for the management of children who have mild head injury. When this happened, the Subcommittee did not make single specific recommendations, presenting instead a range of practice options deemed acceptable

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to the Subcommittee and the panel of practicing physicians on whom the recommendations were tested.

The recommendations have been published recently¹ along with a complete description of the methods used and technical procedures followed in the development of the parameter.⁵

After piecing together the history and physical examination of your patient, you decide to order a CT scan of the head, primarily on the basis of suspected LOC. The CT scan is interpreted as normal. The parent, whom you respect as to her interest and attention to detail with her children, anxiously awaits the outcome of the CT scan and your recommendation.

Recommendations and Practice Options

The recommendations and practice options are divided into two primary sections: 1) involving the case presentation without LOC and 2) dealing with the case presentation and a brief (<1 min) LOC.

INITIAL EVALUATION AND MANAGEMENT OF THE CHILD WHO HAS MINOR CLOSED HEAD INJURY AND NO LOC

Recommendation: Observation

For children who have minor closed head injury and no LOC, a thorough history and appropriate physical and neurologic examinations (including funduscopic examination) should be performed. Observation in the clinic, office, emergency department, or home under the care of a competent caregiver is recommended. Observation implies regular monitoring by a competent adult who can recognize abnormalities and seek appropriate assistance. The use of CT scan, skull radiography, or MRI is not recommended for the initial evaluation and management.

Why did the Subcommittee make this recommendation?

Population-based studies have found that fewer than 1 in 5,000 patients who have minor closed head injury and no LOC have intracranial injuries that require medical or surgical intervention. In one study of 5,252 low-risk patients, mostly adults,

none had an intracranial injury after head injury.⁶ There are no comparably sized studies for children, but in two smaller studies of children who had minor head injury, among those whose neurologic examination findings were normal, had no LOC, and had no other findings, no children had abnormalities on CT scans.^{7,8}

A recent study in adults found that absence of these findings could be used with confidence to predict adults at very low risk for intracranial injury.⁹ Similar types of studies have not been reported in children. Historically, when hospitalization has been used to observe children after head injury, the length of stay has averaged 12 to 48 hours (although there was little evidence to guide the Subcommittee as to the optimal duration of observation). The Subcommittee unanimously agreed that a prudent duration of observation should extend to at least 24 hours and could be accomplished in any combination of locations, including the emergency department, hospital, clinic, office, or home. Assuring competence of the caregiver is critical to successful observation. Understandable, printed instructions should be given to the parent or guardian detailing how to monitor the patient and how to seek medical attention if necessary.

INITIAL EVALUATION OF THE CHILD WHO HAS MINOR CLOSED HEAD INJURY WITH BRIEF LOC

Recommendations: Observation or Cranial CT Scan

Among children who have minor head injury, LOC is uncommon, but it is associated with an increased risk for intracranial injury. In this scenario, the prevalence of intracranial injury detectable on CT ranged from 0 to 7% in four separate studies documented in the parameter.¹ Although most of these intracranial lesions remain clinically insignificant, a substantial proportion of children (2% to 5% of those who have minor head injury and LOC) may require neurosurgical consultation and intervention.

Children who have nonspecific signs, such as headache, vomiting, or lethargy, after closed-head injury may be more likely to have intracra-

nial injury than children who do not have such signs. However, these clinical signs are of limited predictive value, and most children who experience headache, lethargy, or vomiting after minor head injury do not have demonstrable intracranial injury.

For children who have minor closed head injury and brief LOC (<1 min), a thorough history and appropriate physical and neurologic examinations (including mental state and funduscopy) should be performed. Doctors also may opt to manage these children by observation alone (as described previously in the office, clinic, emergency department, hospital, or home under the care of a competent caregiver) or with the addition of cranial CT scanning. The use of skull radiographs or MRI in the initial management is not recommended, primarily because of the lack of sensitivity and specificity of these imaging modalities.

Why didn't the Subcommittee recommend CTs for all children?

The Subcommittee did not find evidence to show that immediate neuroimaging of asymptomatic children produced demonstrable benefits (ie, better outcomes) when compared with a management strategy of initial observation alone. Therefore, the Subcommittee believed it important to leave the initial management up to individual clinicians. Some may opt for observation followed by CT scan if a child worsens; others might feel more comfortable managing a child initially by CT followed by observation.

What about the use of skull radiographs?

Skull radiographs have only a limited role in the evaluation of children who have closed head injury and no LOC, as long as there are no outward signs of skull fracture (eg, palpable depression in the scalp, hemotympanum, Battle sign). The substantial rate of false-positive results associated with skull radiography (ie, skull fracture detected on radiograph in the absence of intracranial injury) combined with the low prevalence of intracranial injury among this specific subset of patients leads to a low predictive

value of this form of imaging and, therefore, little clinical use.

How safe is CT for young children?

CT is a safe procedure, but some healthy children require sedation or anesthesia. Accordingly, the benefits gained from cranial CT should be weighed carefully against the possible harm of sedating or anesthetizing a large number of children.

What about evaluated children whose CT scans are normal?

Neurologically normal patients who have normal findings on cranial CT are at extremely low risk for subsequent problems.

As you re-enter the examination room, you reassure the mother that the CT scan is normal. You also decide that home observation is best under the circumstances and go over the patient information sheet with the mother, emphasizing close observation and a telephone call or return visit for listed "red flags."

Final Questions and Comments

DO PRACTICE PARAMETERS ALONE ENHANCE CLINICAL EFFECTIVENESS?

The short answer is "no." Simply put, practice parameters are a necessary initial step toward improving the effectiveness and outcomes of care, but they are not sufficient in and of themselves. As an essential part of an evidence-based approach to improving child health care, a practice parameter (or defined "best practice") must be combined with other essential ingredients to

improve effectiveness of care. Among these other ingredients are: *defined processes* (such as a care map or disease management scheme) that reduce or eliminate unnecessary variation (including tests or interventions that add no value to the patient's overall care); *decision support*, such as reminders to clinicians, patient decision support, and feedback such as practice profiling; and *measurement of patient outcomes*, as supported by certain clinical indicators, patient satisfaction, functional status, and cost-related measures. The Figure is a diagram of the "sufficient environment" in which practice parameters must be applied so as to enhance clinical effectiveness and realize overall improved care for the greatest number of patients.

RECOMMENDED FUTURE RESEARCH

The Subcommittee recommended three areas of future research:

- 1) *Classification of Head Injury in Children and Prognostic Features.* The implications of clinical events such as LOC and signs and symptoms such as seizures, nausea, vomiting, and headache remain unclear. Future studies of minor closed head injury should assess the relationship between characteristics such as these and the risk for intracranial injury among children who are clinically asymptomatic.
- 2) *The Benefit of Early Detection and Intervention for Intracranial Lesions in Asymptomatic Children.* Additional studies are needed to determine whether a strategy of an

immediate CT scan provides measurably improved outcomes for children who have minor closed head injury compared with a strategy of observation followed by CT scan for children whose clinical status changes.

3) *The Management of the Asymptomatic Patient Who Has an Intracranial Hemorrhage.* The optimal management and prognosis for asymptomatic patients who have intracranial hemorrhages is unknown. If all asymptomatic children who have minor head injury undergo cranial CT scanning, a substantial number in whom results are abnormal may undergo unnecessary or even harmful surgery. Additional research in this area has the potential for shedding new light on optimal management for these patients.

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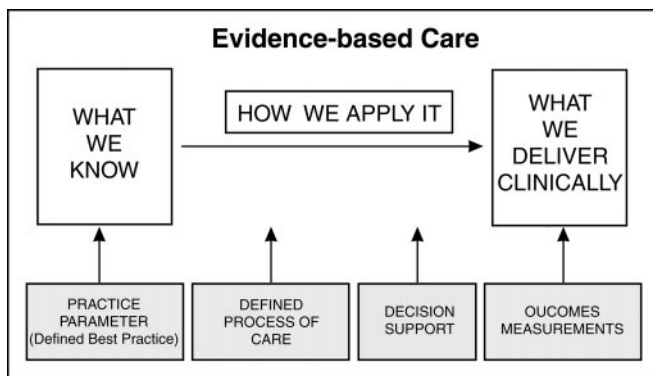


FIGURE. Applying practice parameters within an evidence-based approach to clinical care.

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