Overview

Minor head injuries occur commonly in children and adolescents. Approximately 50% of children who visit hospital emergency departments with a head injury are given a CT scan, many of which may have been able to be treated with observation. Exposure to radiation increases the lifetime risk of cancer because a child’s brain tissue is more sensitive to ionizing radiation. Clinical observation prior to CT decision-making for children with minor head injuries is an effective approach when the PECARN Pediatric Head Injury/Trauma algorithm is paired with physician judgement.1

The PECARN Pediatric Head Injury/Trauma Algorithm was developed by the Pediatric Emergency Care Applied Research Network and is supported by cooperative agreements between seven academic medical centers and the Health Resources Services Administration/Maternal and Child Health Bureau/Emergency Medical Services for Children Program (HRSA/MCHB/EMSC). The PECARN Pediatric Head Injury/Trauma Algorithm applies only to patients with a Glasgow Coma Scale of 14 or higher.

Using the PECARN Pediatric Head Injury/Trauma Algorithm

1. Use the Glasgow Coma Scale (GCS) to determine if the pediatric patient fits the required criteria for evaluation using the PECARN algorithm.

The Glasgow Coma Scale is based on a 15 point scale for estimating and categorizing the outcomes of brain injury on the basis of overall social capability or dependence on others. The minimum score is 3 points which designates a deep coma or brain death. The test measures the motor response, verbal response and eye opening response with these values.3

   I. Motor Response
      6 – Obey commands fully
      5 – Localizes to noxious stimuli
      4 – Withdraws from noxious stimuli
      3 – Abnormal flexion, i.e. decorticate posturing
      2 – Extensor response, i.e. decerebrate posturing
      1 – No response

   II. Verbal Response
      5 – Alert and Oriented
      4 – Confused, yet coherent, speech
      3 – Inappropriate words and jumbled phrases consisting of words
      2 – Incomprehensible sounds
      1 – No sounds

   III. Eye Opening
      4 – Spontaneous eye opening
      3 – Eyes open to speech
      2 – Eyes open to pain
      1 – No eye opening
2. Determine the GCS by adding the values of I+II+III.
   This number helps medical practitioners categorize the four possible levels for survival, with
   a lower number indicating a more severe injury and a poorer prognosis:
   
   **Mild = GCS Score of 13-15:**
   **Moderate Disability = GCS Score of 9-12:**
   **Severe Disability = GCS Score of 3-8:**

3. Apply the PECARN Pediatric Head Injury/Trauma algorithm and validate your
   recommendation with your clinical findings.

**For ages less than 2:** (adapted from Kupperman, et al)

- **GCS = 14 or other signs of altered mental status, or palpable skull fracture**
  - Yes: CT Recommended
  - No: Occipital or parietal or temporal scalp hematoma, or history of LOC, or severe mechanism of injury, or not acting normally per parent
    - Yes: Observation versus CT on the basis of other clinical factors including:
      - Physician experience
      - Multiple versus isolated findings
      - Worsening symptoms or signs after emergency department observation
      - Age < 3 months
    - No: CT not recommended

- No: CT not recommended
For ages greater than 2: (adapted from Kupperman, et al)

1. **GCS = 14 or other signs of altered mental status, or palpable skull fracture**
   - Yes → **CT Recommended**
   - No → **History of LOC, or history of vomiting, or severe mechanism of injury, or severe headache**

2. **History of LOC, or history of vomiting, or severe mechanism of injury, or severe headache**
   - Yes → Observation versus CT on the basis of other clinical factors including:
     - Physician experience
     - Multiple versus isolated findings
     - Worsening symptoms or signs after emergency department observation
     - Parental preference
   - No → **CT not recommended**

3. If the pediatric patient does not need a head CT, observation is recommended for the patient's current condition

References