disease and death." [Gunderson, 279 S.W.3d at 107 (citing Globetti v. Sandoz Pharms. Corp., 111 F.Supp.2d 1174, 1177 (N.D. Ala. 2000)); State v. Edwards, 2011 WL 1378927 (Ohio Ct. App. April 13, 2011); State v. Carr, 2010 WL 2473337 (Ohio Ct. App. June 18, 2010)] However, some courts have questioned its reliability.[470]

Tangent to this misunderstanding has been the prevalent issue of referring to the AHT diagnosis as a "triad" (ie, diagnosed if the child has subdural hemorrhages, RHs, and cerebral edema).[471] It is this relegation to heuristic application of the 3 more common findings of the diagnosis that has fostered legal misunderstanding of the aforementioned complex diagnostic process. The pediatric provider will need to be prepared to explain to courts that the evolution of diagnostic understanding of AHT has broadened to try and capture, in definition, the myriad of ways inflicted injury to a child's head can occur and manifest. This understanding, again, may be fostered by current clinical prediction rules and pooled analyses, showing how variable combinations of clinical features can hold extremely high odds for the AHT diagnosis and not just the "triad."[51]

Finally, and probably most importantly, has been the prevalent issue of ethical expert testimony in AHT cases. Some authors have asserted that AHT cases have been a minefield of irresponsible expert testimony.[472,473] In a medicolegal analysis of overturned shaken baby syndrome (SBS)/AHT convictions in the US appellate system over a 10-year period, Narang et al found that: 1) medical evidence-related themes raised on appeal seldom reflected new scientific or clinical discoveries but rather were alternative or differing medical opinions from those offered at the original trial; and 2) that their review of over 1400 appellate cases over a 10-year period "tended to support the concerns of other authors regarding irresponsible communication of medical information in AHT/SBS cases."[473] Thus, the pediatric provider should be prepared to educate the legal system not only about what is sound science in AHT, but also what is junk science. To complete this task, it will be important for the pediatric provider to be versed in the principles of ethical expert testimony espoused by the AAP.[474]

MANAGEMENT

Introduction

Although AHT comprises a significant fraction of head injuries requiring hospitalization in children younger than 5 years, no evidence-based guidelines for the management of the child with AHT currently exist.[98] Guidance regarding the medical and surgical treatment may be abstracted from a combination of existing literature on the management of pediatric and adult head injury as well as a small volume of literature specific to AHT.

Medical Treatment

Guidelines for the management of pediatric severe traumatic brain injury were initially developed in 2003 by a panel of experts in traumatic brain injury during the fifth Annual Aspen Neurobehavioral Conference.[475,476] The guidelines were updated most recently by the Brain Trauma Foundation in 2019.[477] Current guidelines present evidence-based recommendations on 3 broad categories: monitoring (3 topics), thresholds for treatment (2 topics), and treatment (10 topics). These guidelines are not specific to the infant population or to the child with AHT. In 2 topics covered by the guidelines, additional literature specific to the infant or child with AHT mandates special consideration of this patient population:

- Intracranial pressure monitoring: The 2019 Guidelines for the Management of Pediatric Severe Traumatic Brain Injury suggest the use of intracranial pressure monitoring as an option capable of improving overall neurologic outcomes in pediatric patients. However, the guidelines clarify that "(b)ecause there are no imaging or other biomarkers that indicate a patient with intracranial hypertension, it is recommended that ICP is measured to determine if intracranial hypertension is present" and that "studies support the association of successful ICP monitor–based management of intracranial hypertension with improved survival and neurologic outcome."[477] Furthermore, as suggested treatment thresholds are based on measurements, a lack of intracranial pressure monitoring in the setting of intracranial hypertension limits management.
- Thresholds for Treatment: The 2019 Guidelines for the Management of Pediatric Severe Traumatic Brain Injury suggest the treatment of intracranial pressure (ICP) targeting a threshold of <20 mm Hg as "mortality is often due to refractory sustained increases in ICP." Thus, "preventing intracranial hypertension is central to current neurocritical care of these children."[477] In addition, thee 2019 guideline further suggests treatment to maintain CPP (cerebral perfusion pressure) at a minimum of 40 mm Hg using a range from 40 to 50 mm Hg, "with infants at the lower end and adolescents at or above the upper end of this range."[477]
- Treatment Topics: The 2019 Guidelines for the Management of Pediatrics Severe Traumatic Brain Injury further identified the following recommendations[477]:
  - Bolus hypertonic saline (3%) is recommended in patients with intracranial hypertension. Recommended effective doses for acute use range from 2 to 5 mL/kg over 10 to 20 minutes.
  - Continuous infusion hypertonic saline is suggested in patients with intracranial hypertension. Suggested effective doses as a continuous infusion of 3% saline range from 0.1 to 1.0 mL/kg of body weight per hour,