G52 An Evaluation of the Discriminatory Power of Clinical Diagnostic Findings of Abusive Head Trauma Using U.S. Hospital Data

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After attending this presentation, attendees will understand the degree of diagnostic accuracy of abusive head trauma models for acutely head-injured children.

This presentation will impact the forensic science community by contributing new information to the ongoing medicolegal discussion concerning the clinical basis for a diagnosis of abusive head trauma in children.

The diagnosis of Abusive Head Trauma (AHT) in a child or infant is typically based on the clinical triad of subdural hematoma, retinal hemorrhage, and encephalopathy in an acutely head-injured child without a history of explanatory trauma.[1-5] The presence of additional findings associated with abuse, e.g., external injuries and bone fractures, *inter alia*, adds strength to the likelihood that the diagnosis is accurate.[6] The predictive accuracy of the triad and associated findings is unknown, however. There is currently no standard case definition for AHT and no clinical test that distinguishes between intentional and unintentional head injury, and the diagnosis of AHT is therefore made inconsistently, often reflecting personal beliefs, biases, and practices, rather than a consensus-derived gold standard.[7,8] This absence of a gold standard will ultimately lead to the over- and under-diagnosis of AHT. The potential for over-diagnosis is particularly of a concern when only triad findings are present and there are no other findings indicative of abuse.[9]

Experimental clinical trials with proper case and control groups are, for obvious reasons, not feasible for an injury such as AHT. In the alternative, other approaches utilizing observational data have recently been employed as a means of evaluating the discriminatory power of diagnostic algorithms for AHT.[6,10-12] Additionally, the Centers for Disease Control and Prevention (CDC) have developed a standard case definition for non-fatal AHT based on International Classification of Diseases (ICD)- 9 codes for routine surveillance purposes.[13] The present study assessed the validity of two epidemiologically-derived clinical prediction rules for AHT: the five-variable model proposed by Hymel and colleagues and the six-variable model introduced by Maguire and colleagues.[6,10] The discriminatory power of both models was validated using U.S. hospital data abstracted from the Kids' Inpatient Database (KID) of the Healthcare Cost and Utilization Project of the Agency for Healthcare Research and Quality for 2000-2009. The KID database contains data from a stratified sample of 80% of pediatric discharges from U.S. hospitals and thus provides users of the database with a large, representative sample size allowing for investigation of rare conditions and treatments, and the extrapolation of the results to the background population. The KID database was queried for children <3 years of age fitting the inclusion criteria of the two models, respectively. Children involved in a traffic accident or whose records were indicated were excluded. Each child was classified as "abused" or "other" based on the presence of an abuse ICD-9 code. The models were then applied by categorizing children with any ICD-9 code corresponding to the variables proposed as indicative of abuse as likely abused and sensitivity, specificity, positive predictive value, and negative predictive value for both models respectively were calculated and compared to the results found in the original studies.

It was found that currently available diagnostic algorithms for AHT have low discriminatory power when present (low specificity and low positive predictive value) but high discriminatory power when absent (negative predictive value >0.9), and thus of limited practical use. Relying solely or too heavily on such algorithms entails a substantial risk of misdiagnosis. Caution in interpreting clinical diagnostic findings absent collateral evidence of abuse is necessary in the investigation of AHT, and the use of triad findings alone as an indication of AHT is improper and potentially harmful.

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