Medical Xpress

Study highlights potential benefits of continuous EEG monitoring for infant patients

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A recent retrospective study evaluating continuous electroencephalography (cEEG) of children in intensive care units

(ICUs) found a higher than anticipated number of seizures. The work also identified several conditions closely associated with the seizures, and suggests that cEEG monitoring may be a valuable tool for helping to identify and treat neurological problems in patients who are 14 months old or younger.

"The retrospective analysis was conducted by a team of engineers, who were able to make use of robust statistical methodologies to control for observational bias," says Julie Swann, co-author of a paper on the work. "It was possible due to a long-standing partnership with institutions such as Children's Healthcare of Atlanta and Emory University, which had been collecting data on a large cohort of pediatric patients receiving continuous monitoring. Among other things, this allowed us to identify a risk threshold of 14 months. Patients younger than 14 months were at much higher risk of having seizures." Swann is department head and A. Doug Allison Distinguished Professor of the Fitts Department of Industrial and Systems Engineering at North Carolina State University.

EEGs measure electrical activity in the brain, and are often used to detect potential neurological problems. Conventional EEGs usually last less than an hour, but cEEGs allow health care providers to monitor brain activity for hours or days. However, cEEGs are not in widespread use, due to the expense of related hardware and software and costs associated with having the skilled personnel needed to monitor and interpret cEEG data.

"One reason for the study is that there has been very little research to determine whether cEEG would be a worthwhile investment for monitoring young children," says Pinar Keskinocak, Ph.D., who co-authored the paper. "Even harder is to determine whom to monitor, where our results suggest some of the risk factors to consider.

"Our main finding is the unexpectedly high prevalence of mostly non-

symptomatic seizures in very young children," says Keskinocak, the William W. George Chair and Professor in Georgia Tech's Stewart School of Industrial Engineering and the director of the Center for Health and Humanitarian Systems at Georgia Tech. "Non-symptomatic seizures are those that can be detected with an EEG, but that do not present any outward, physical symptoms. Children over the age of 14 months had an overall seizure rate of 18 percent. However, we found that children aged 14 months and younger had an overall seizure rate of 45 percent."

"In addition, we found that – for these younger patients – seizures were often associated with one of the following conditions: hypoxic-ischemic encephalopathy, intracranial hemorrhage or central nervous system infection," says Dr. Larry Olson of Children's Healthcare of Atlanta and Emory University.

"In fact, those conditions were associated with 61 percent of the seizure patients we identified who were under 14 months old," says Dr. Atul Vats, also of Children's Healthcare of Atlanta and Emory University.

"All of this is important because it means that cEEG may have value in helping to diagnose neurological problems in young patients," Swann says. "And early diagnosis could help ensure that patients get treatment in a timely way, which would – hopefully – improve outcomes. Only an interventional study could demonstrate that. Maybe these findings will pave the way for that work."

The retrospective study analyzed data on 517 children who were monitored by cEEG. All of the children were ICU patients. Because the children had been selected for cEEG monitoring, they likely presented a higher risk of neurological problems than the general population, which should be taken into account when evaluating the seizure prevalence data.

"Hospitals have started recognizing the value of detecting and preventing seizures to improve patient outcomes," Keskinocak says. "The investment needed towards cEEG monitoring may be substantial. This study indicates that those expenditures may be warranted. We hope that it encourages researchers to pursue studies that could determine whether cEEG monitoring could improve health outcomes for the youngest ICU patients."

The paper, "Risk Factors for Seizures Among Young Children Monitored with Continuous Electroencephalography in Intensive Care Unit: A Retrospective Study," is published in the journal Frontiers in Pediatrics.

More information: Jan Vlachy et al. Risk Factors for Seizures Among Young Children Monitored With Continuous Electroencephalography in Intensive Care Unit: A Retrospective Study, *Frontiers in Pediatrics* (2018). DOI: 10.3389/fped.2018.00303

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