

CLINICAL VALIDATION OF A NEONATAL SEIZURE DETECTION ALGORITHM

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Background and Aim: Since there is compelling evidence that seizures are harmful to the immature developing brain, accurate seizure detection at the cotside is imperative. Multichannel EEG is a reliable method for confirming neonatal seizures but interpretation requires expertise. We recently developed a neonatal seizure detection algorithm (NSDA) to aid EEG interpretation. We aimed to validate this algorithm using unseen data recorded in the neonatal intensive care unit (NICU).

Methods: The NSDA was previously trained using an EEG dataset of 18 term neonates with seizures. The validation dataset contained lengthy and unprocessed multichannel EEG records from 41 term neonates with hypoxic-ischaemic encephalopathy. A total of 377 electrographic seizures were visually annotated by an experienced neurophysiologist in 7 of the 41 neonates. The performance of the NSDA was assessed using sensitivity and specificity via a receiver operating characteristic (ROC), the seizure detection rate and false alarm rate.

Results: The NSDA identified 7/7 neonates with seizures and 33/34 neonates without seizures (AUROC=0.954). The median error between the annotations of the neurophysiologist and the NSDA was 49 seconds/hour for neonates with seizures and 0 seconds/hour for neonates without seizures. The seizure detection rate was 60% with a false alarm rate of 0.1/hour. The seizure detection rate could be improved by increasing the false alarm rate.

Conclusion: Our NSDA is approaching a level of accuracy that is sufficient for clinical implementation in the NICU. Further tests are ongoing to determine the common sources of false alarms which will help improve the NASDA performance.