

Correlation between Electroencephalogram and Clinical Assessment of Neonatal Seizures in Full Term Neonates



Bhana NB, Reid-Herrera S, Patel A, Hunter K, Feldman-Winter L, Kushnir A

Department of Pediatrics, Division of Neonatology, Cooper University Hospital, Camden, NJ
Cooper Medical School of Rowan University



Background

As advancements in neonatal care have been made, mortality has decreased but morbidity has increased. One of these morbidities is subclinical seizures, or seizures associated with subtle clinical findings that are difficult to diagnose. Due to the difficulty in diagnosing such seizures, infants may be undertreated if undiagnosed or overtreated if diagnosed inaccurately. An EEG is performed when there is clinical suspicion for seizure. However, there is minimal consensus on how to properly treat clinical events detected on physical exam without electroencephalogram (EEG) findings, or how aggressively to treat seizures detected clinically and on EEG. In addition, many newborns with neonatal seizures are discharged from neonatal intensive care units (NICU) while on anticonvulsant medications, however there isn't clear guidance on when to discontinue medication and on the factors that impact this decision making. There is a need for research to better articulate optimal treatment duration and timing of treatment discontinuation for full term neonates who have seizures as these may affect long term outcomes and achievement of developmental milestones.

Aim

- To determine whether there is a difference in continuing need for medical seizure treatment at the time of NICU discharge and one year after discharge in **full** term babies diagnosed with seizures primarily via physical exam versus physical exam and EEG.

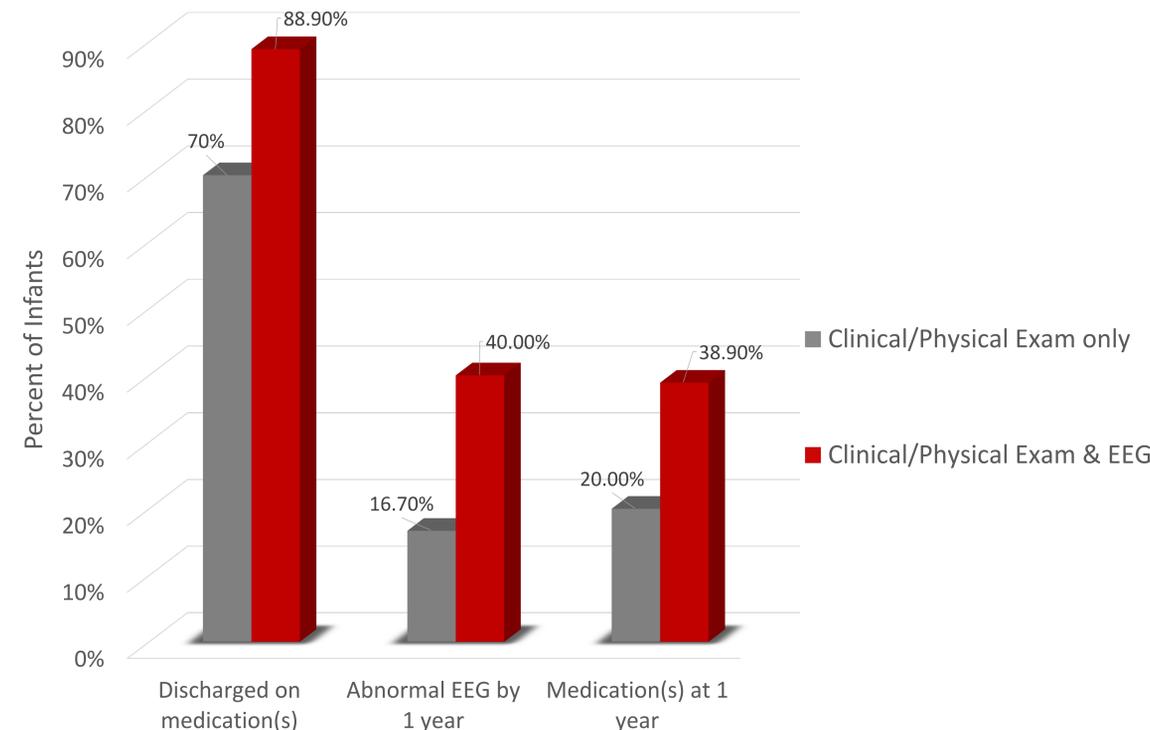
Methods

- IRB-approved, retrospective cohort admitted to the NICU of a tertiary urban hospital in NJ from 01/01/2010 to 09/01/2019
- Inclusion criteria:**
 - Full term infants (Gestational age > 37 weeks)
 - Documentation of a neurological exam and/or EEG suspicious for seizures
- Exclusion criteria:**
 - No confirmed seizure activity
 - NAS with no seizure activity
 - Death prior to discharge
 - No 12 month follow-up data
 - Transfer to another hospital
- Neonates who were clinically diagnosed with seizures were compared with neonates with EEG diagnosis of seizures to detect if there was a difference in medications use at discharge and one year after discharge.
- Additional measured variables include birth weight, gestation age, and demographic information
- A descriptive analysis, independent T-tests, and chi-square tests were used for data analysis.

Table 1. Demographics

Diagnosed via:	Clinical/Physical Exam only	Clinical/Physical Exam & EEG	Total
Gender			
Male	51.9%	48.1%	56.3%
Female	76.2%	23.8%	43.8%
Race/Ethnicity			
Caucasian	77.8%	22.2%	18.8%
African-American	63.6%	36.4%	45.8%
Asian	0	0	0
Hispanic	56.3%	43.8%	33.3%
Other	4.2%	0	4.2%
Length of Stay, days (mean)			
	23.67 (± 19.44)	17.78 (± 10.18)	21.46 (± 15.70)
Birthweight, grams (mean)			
	3,142.38 (± 462.26)	3189.17 (± 494.15)	3,160.30 (± 469.94)

Figure 1. Seizure medication use based on method of seizure diagnosis



Results

- Of a total of 335 neonates evaluated from 01/01/2010 to 09/01/2019, 48 full term neonates (GA > 37 weeks) with seizures were included
- Seizure diagnosis via EEG was confirmed in 18 (37.5%) neonates and the remaining 30 (62.5%) neonates were diagnosed clinically only
- Of the 18 neonates diagnosed *clinically and via EEG*:
 - 16/18 (88.9%) were discharged on seizure medications
 - 7/18 (38.9%) were taking seizure medications at 1 year
 - 4/10 (40%) had an abnormal EEG between discharge and 1 year follow-up
- Of the 30 neonates diagnosed *clinically only*:
 - 21/30 (70%) were discharged on seizure medications
 - 6/30 (20%) were taking seizure medications at time of 1 year
 - 1/6 (16.7%) had an abnormal EEG between discharge and 1 year follow-up
- The difference in medication use at discharge was not statistically different, (p=0.171), nor was use at 1 year (p=0.190) between neonates diagnosed clinically and via EEG, however, more neonates diagnosed with EEG were still requiring medication at 1 year (20% vs 39%).
- There was no difference in abnormal EEGs reported before 1-year follow-up (p=0.588) between the two groups

Conclusion

- These results suggest that the method of neonatal seizure diagnosis is not associated with medication use at discharge or at 1 year
- For both groups, nearly the same percentage of infants that were taking seizure medications at 1 year also had an abnormal EEG between discharge and 1 year follow-up
- There were trends for higher continued medication use at one year in neonates with EEG documentation, which may show significance in a larger study.

References

- Murray DM, Boylan GB, Ali I, et al. Defining the gap between electrographic seizure burden, clinical expression and staff recognition of neonatal seizures Archives of Disease in Childhood - Fetal and Neonatal Edition 2008;93:F187-F191.
- Glass HC, Wirrell E. Controversies in neonatal seizure management. J Child Neurol. 2009;24(5):591-599.
- Pisani F, Pavlidis E. The role of electroencephalogram in neonatal seizure detection. Expert Rev Neurother. 2018;18(2):95-100.
- Britton JW, Frey LC, Hopp, JLet. Electroencephalography (EEG): An Introductory Text and Atlas of Normal and Abnormal Findings in Adults, Children, and Infants. American Epilepsy Society. 2016.
- Kang, SK and Kadam, SD. Neonatal Seizures: Impact on Neurodevelopmental Outcomes. Front Pediatr. 2015;3:101.
- Ronen GM, Buckley D, Penney S, Streiner DL. Long-term prognosis in children with neonatal seizures: a population-based study. Neurology. 2007;69(19):1816-1822.
- McBride, MC, Laroia, N, and Guillet R. Electrographic seizures in neonates correlate with poor neurodevelopmental outcome. Neurology. 2000;55(4): 506-514.