Impact of Electroencephalogram vs. Clinical Diagnosis on Medication Management of Premature Neonatal Seizures

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**Background**

Subclinical and clinically evident seizures are difficult to diagnose in the neonatal population, as clinical features are subtle and can resemble typical neonatal movements. While the use of video-EEG for monitoring is the preferred standard, it is not always available nor is it always feasible to use in preterm neonates. As a result, preterm infants may be medically under- or over-treated with seizure medication based on clinical seizure diagnoses. Many preterm neonates with seizures are discharged on seizure medications with no clear guidelines on when to discontinue the medications. This study is investigating possible differences in medical seizure treatment at discharge and at 1-year follow-up for preterm neonates who were diagnosed clinically with physical exam compared to those diagnosed via EEG. The data may contribute to a better understanding of optimal seizure treatment duration and timing of discontinuation for pre-term neonates.

**Methods**

- **Data Collection:** Retrospective chart review of premature neonates (<37 weeks) born in 1 urban level 3 NICU between January 2009 and September 2019
- **Admitted to the NICU and underwent neurological examination due to suspected seizure activity**
- **Detailed seizure medication and clinical characteristic information was documented for each patient during hospital admission, upon discharge, and at 1-year follow-up**
- **Descriptive analysis, Independent T Tests, and Chi Square Tests were used for data analysis**

**Inclusion Criteria**

- Diagnosed with seizure either via clinical physical exam or via EEG
- Born via vaginal or C-section admitted to the NICU

**Exclusion Criteria**

- Diagnosed with NAS
- Death before discharge
- Transferred to another hospital
- Missing follow-up data at 1 year

**Aim**

- To determine whether there is a difference in continuing need for medical seizure treatment at the time of neonatal intensive care unit (NICU) discharge and one year after discharge in preterm neonates diagnosed with seizures primarily via physical exam versus via EEG.

**Table 1. Demographics including both study groups**

<table>
<thead>
<tr>
<th></th>
<th>Clinical (n=44)</th>
<th>EEG (n=12)</th>
<th>P value</th>
<th>Total (n=56)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>47.7%</td>
<td>66.7%</td>
<td>0.244</td>
<td>51.8%</td>
</tr>
<tr>
<td>Female</td>
<td>52.3%</td>
<td>33.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Birth Weight, grams (SD)</td>
<td>1012 (+/- 718)</td>
<td>1366 (+/- 1099)</td>
<td>0.186</td>
<td>1088 (+/- 816)</td>
</tr>
<tr>
<td>Mean Gestational Age, weeks (SD)</td>
<td>27.22 (+/- 3.76)</td>
<td>28.40 (+/- 4.15)</td>
<td>0.347</td>
<td>27.47 (+/- 3.84)</td>
</tr>
<tr>
<td>Race: White</td>
<td>13.6%</td>
<td>25.0%</td>
<td>0.385</td>
<td>16.1%</td>
</tr>
<tr>
<td>Race: Black</td>
<td>70.5%</td>
<td>8.3%</td>
<td>&lt;0.001</td>
<td>57.1%</td>
</tr>
<tr>
<td>Race: Asian</td>
<td>0.0%</td>
<td>8.3%</td>
<td>0.214</td>
<td>1.8%</td>
</tr>
<tr>
<td>Race: Hispanic</td>
<td>15.9%</td>
<td>41.7%</td>
<td>0.105</td>
<td>21.4%</td>
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<tr>
<td>Race: Other</td>
<td>0.0%</td>
<td>16.7%</td>
<td>&lt;0.05</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

**Figure 1. Comparison of Seizure Medication Use during Hospitalization and at 1 year follow-up**

**Figure 2. EEG findings after discharge prior to 1 year follow up compared to abnormal EEG findings prior to 18/24 month follow up based on method of seizure diagnosis at birth**

**Figure 3. Seizure medication distribution by study group during hospitalization in the NICU versus at 1 year follow-up**

**Results**

- Seizure diagnosis was made via clinical physical exam in 44 (78.6%) patients and via EEG in 12 (21.4%)
- 24/44 (54.5%) of neonates diagnosed via physical exam were discharged on seizure medication compared to 10/12 (83.3%) diagnosed via EEG (p=0.099)
- 15/44 (34.1%) patients diagnosed via physical exam continued to take seizure medication at 1-year follow-up compared to 7/12 (58.3%) patients diagnosed via EEG (p=0.184)
- EEG at 1-year follow-up was abnormal in 6/19 (31.6%) neonates originally diagnosed via physical exam and abnormal in 2/7 (28.6%) neonates originally diagnosed via EEG (p=0.100)

**Conclusion**

There was no statistically significant difference in continuing need for seizure medication at 1-year follow-up for preterm neonates diagnosed with seizures via physical exam versus via EEG. Additionally, there was no difference in reported abnormal EEG at 1-year follow-up, suggesting the method of diagnosis does not significantly change outcomes of medication duration or need for premature neonates with seizures.

**References**