NEONATAL EPINEPHRINE:
REDUCING CALCULATION ERRORS

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Introduction

Problem - background

Intervention - Epi Chart

Comparison - research

Outcome - results
Problem

Epinephrine calculation errors during neonatal resuscitation of LBW and VLBW babies can significantly affect outcomes in terms of neonatal mortality and morbidity.
# Intervention

## Epi Chart

<table>
<thead>
<tr>
<th>Weight (gms)</th>
<th>Vascular 0.1-0.3 mL/kg</th>
<th>Vascular 0.5-1.0 mL/kg</th>
<th>Endotracheal 0.1-0.3 mL/kg</th>
<th>Endotracheal 0.5-1.0 mL/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>0.04 - 0.12 mls</td>
<td>0.20 - 0.40 mls</td>
<td>0.19 - 0.57 mls</td>
<td>0.95 - 1.90 mls</td>
</tr>
<tr>
<td>450</td>
<td>0.04 - 0.13 mls</td>
<td>0.22 - 0.45 mls</td>
<td>0.20 - 0.60 mls</td>
<td>1.00 - 2.00 mls</td>
</tr>
<tr>
<td>500</td>
<td>0.05 - 0.15 mls</td>
<td>0.25 - 0.50 mls</td>
<td>0.21 - 0.63 mls</td>
<td>1.05 - 2.10 mls</td>
</tr>
<tr>
<td>550</td>
<td>0.05 - 0.16 mls</td>
<td>0.27 - 0.55 mls</td>
<td>0.22 - 0.66 mls</td>
<td>1.10 - 2.20 mls</td>
</tr>
<tr>
<td>600</td>
<td>0.06 - 0.18 mls</td>
<td>0.30 - 0.60 mls</td>
<td>0.23 - 0.69 mls</td>
<td>1.15 - 2.30 mls</td>
</tr>
<tr>
<td>650</td>
<td>0.06 - 0.19 mls</td>
<td>0.32 - 0.65 mls</td>
<td>0.24 - 0.72 mls</td>
<td>1.20 - 2.40 mls</td>
</tr>
<tr>
<td>700</td>
<td>0.07 - 0.21 mls</td>
<td>0.35 - 0.70 mls</td>
<td>0.25 - 0.75 mls</td>
<td>1.25 - 2.50 mls</td>
</tr>
<tr>
<td>750</td>
<td>0.07 - 0.22 mls</td>
<td>0.37 - 0.75 mls</td>
<td>0.26 - 0.78 mls</td>
<td>1.30 - 2.60 mls</td>
</tr>
<tr>
<td>800</td>
<td>0.08 - 0.24 mls</td>
<td>0.40 - 0.80 mls</td>
<td>0.27 - 0.81 mls</td>
<td>1.35 - 2.70 mls</td>
</tr>
<tr>
<td>850</td>
<td>0.08 - 0.25 mls</td>
<td>0.42 - 0.85 mls</td>
<td>0.28 - 0.84 mls</td>
<td>1.40 - 2.80 mls</td>
</tr>
<tr>
<td>900</td>
<td>0.09 - 0.27 mls</td>
<td>0.45 - 0.90 mls</td>
<td>0.29 - 0.87 mls</td>
<td>1.45 - 2.90 mls</td>
</tr>
<tr>
<td>1000</td>
<td>0.10 - 0.30 mls</td>
<td>0.50 - 1.00 mls</td>
<td>0.30 - 0.90 mls</td>
<td>1.50 - 3.00 mls</td>
</tr>
<tr>
<td>1100</td>
<td>0.11 - 0.33 mls</td>
<td>0.55 - 1.10 mls</td>
<td>0.31 - 0.93 mls</td>
<td>1.55 - 3.10 mls</td>
</tr>
<tr>
<td>1200</td>
<td>0.12 - 0.36 mls</td>
<td>0.60 - 1.20 mls</td>
<td>0.32 - 0.96 mls</td>
<td>1.60 - 3.20 mls</td>
</tr>
<tr>
<td>1300</td>
<td>0.13 - 0.39 mls</td>
<td>0.65 - 1.30 mls</td>
<td>0.33 - 0.99 mls</td>
<td>1.65 - 3.30 mls</td>
</tr>
<tr>
<td>1400</td>
<td>0.14 - 0.42 mls</td>
<td>0.70 - 1.40 mls</td>
<td>0.34 - 1.02 mls</td>
<td>1.70 - 3.40 mls</td>
</tr>
<tr>
<td>1500</td>
<td>0.15 - 0.45 mls</td>
<td>0.75 - 1.50 mls</td>
<td>0.35 - 1.05 mls</td>
<td>1.75 - 3.50 mls</td>
</tr>
<tr>
<td>1600</td>
<td>0.16 - 0.48 mls</td>
<td>0.80 - 1.60 mls</td>
<td>0.40 - 1.20 mls</td>
<td>2.00 - 4.00 mls</td>
</tr>
<tr>
<td>1700</td>
<td>0.17 - 0.51 mls</td>
<td>0.85 - 1.70 mls</td>
<td>0.45 - 1.35 mls</td>
<td>2.25 - 4.50 mls</td>
</tr>
<tr>
<td>1800</td>
<td>0.18 - 0.54 mls</td>
<td>0.90 - 1.80 mls</td>
<td>0.50 - 1.50 mls</td>
<td>2.50 - 5.00 mls</td>
</tr>
</tbody>
</table>

AMERICAN PHARMACEUTICAL ASSOCIATION

LISTED EPINEPHRINE ON THE HIGH RISK LIST FOR MEDICATION ERRORS
Relevant Conceptual Framework

Taxonomy of Patient Safety

**Medication Errors**

1. Reliance on memory
2. Lack information access
3. Error-proof procedures
4. Standardized processes

(Benner, Sheets, Uris, Malloch, Schwed, & Jamison, 2002).

The value of the Delphi Technique is using expert support to help develop the tools needed (Hannah, 1998).
Simple standardized drug dosing systems such as pre-calculated Epinephrine dose reference charts were recommended but none were found for neonatal weights less than 3 kg.
Methodology

- **Design** – quantitative, quasi-experimental, pilot

- **Sample** – RN, LPN, RT, Physicians, **subjects must be NRP trained**

- **Setting** – L&D, NICU, NBN, Postpartum

- Ethical Considerations - IRB approval, no identifiers, volunteer assistants …
Subject must answer one written neonatal scenario question requesting the amount of Epinephrine to be administered.

Experimental Group
Used the Epi Chart

Control Group
Did not use the Epi Chart and answered according to routine practice
Research Question

Does the utilization of a pre-calculated intravenous and endotracheal Epinephrine Dosage Chart reduce medication errors in neonatal resuscitation?
**Level of Licensure**

- **RN**: 85%
- **LPN**: 3%
- **RT**: 7%
- **PHYSICIAN**: 5%

**Sample n=86**

- **RN**: 73
- **LPN**: 3
- **RT**: 6
- **PHYSICIAN**: 4

*Figure 1. Level of Licensure*
Primary Area of Practice

- NICU: 36
- L&D: 19
- POSTPARTUM: 16
- NBN/SCN: 15
11 or > years    41
6 to 10 years    16
2 to 5 years     20
< 1 year         9
NRP current in the last 2 years?

<table>
<thead>
<tr>
<th>YES</th>
<th>73</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>13</td>
</tr>
</tbody>
</table>

**Completed NRP in < 2 Years**

Figure 4. Completed NRP in >2 Years
Results

- The Chi Square Test Statistics Summary indicated \textbf{statistical difference} in the two tested Groups based on observed and expected frequencies,

- at the 0.01 alpha level (99\% statistical confidence),

- the results indicated that based on the two tested groups the \textit{experimental group} had a \textbf{significant} increase in correct responses indicating that utilization of the \textbf{Epi Chart©} would contribute to reduction of medication errors.
Discussion

IMPLICATIONS FOR NURSING

- Adds to body of knowledge in nursing
- Empowers the practice of nursing
- Improve patient care
- Improve patient outcomes

LIMITATIONS

- One healthcare facility utilized
- One geographical area included
- Newly developed instrument
- Convenience sample
Recommendations

- Replicate the study at other facilities
- Replicate the study in other geographical areas
- Further test Instrument reliability
- Implement to nursing practice
- Implement to standard in NRP training
- Posters, publication, lectures
Replication Study

Research Question

1). Does the utilization of the pre-calculated intravenous and endotracheal Epinephrine Dosage Chart reduce medication errors in neonatal resuscitation?

2). Does the replication of the research determine instrument reliability?
<table>
<thead>
<tr>
<th>METHODOLOGY</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design: same</td>
<td>Sample: 95 nurses total</td>
</tr>
<tr>
<td>Sample: same</td>
<td>Primary Area: 55% L&amp;D</td>
</tr>
<tr>
<td>Setting: nursing conference in another city</td>
<td>Experience: 72% &gt; 11 yrs.</td>
</tr>
<tr>
<td>Procedure: same</td>
<td>NRP trained: 86% current</td>
</tr>
</tbody>
</table>
Chi Square-test for independence resulted in a p-value of <0.0001. Suggesting calculation errors were significantly different for those given Epi Charts versus the control.

Odds Ratio- The difference was quantified with the calculation of an odds ratio, 39.8. Those not given the Epi Chart were 39.8 times more likely to make an Epinephrine dosage error than those given an Epi Chart.
Recommendations

- Replicate the study at other facilities
- Replicate the study in other geographical areas
- Further test Instrument reliability
- Implement to nursing practice
- Implement to NRP training
- Posters, publication, lecture
Encourage nurses to utilize resources rather than rely on memory.
www.neonatal-epichart.com