A COMPARISON OF QUALITY OUTCOMES IN TWO METHODS OF BLOOD SAMPLING IN PEDIATRIC INPATIENTS

Renee Twibell, PhD, RN1; Paula Hofstetter, BS, RN1; Dava Brown, BS, RN, CRNI1; Holly Jones, BS, RNC-OB, BC1; Debra Siela, PhD, RN, CCNS, ACNS-BC2

1Indiana University Health Ball Memorial Hospital 2Ball State University School of Nursing, Muncie, IN

Introduction and Purpose
The majority of pediatric inpatients require blood tests, which are commonly obtained by venipuncture. Patients and families report pain and dis-satisfaction with venipunctures. Debate exists about whether blood samples can be drawn accurately from existing infusing IVs to reduce the pain, trauma and dis-satisfaction associated with venipunctures. This original research study proposed to compare quality outcomes from two methods of blood sampling, specifically drawing blood per venipuncture and per a peripheral infusing intravenous (IV) access.

Design, Sample, Instrumentation

Sample: Pediatric inpatients (n = 95) from one Midwestern teaching hospital.

Inclusion criteria:
- ages 6 months-17 years
- weighs at least 16 pound
- parent or guardian reads and understands English
- has a 24- gauge or larger peripheral IV with a continuous infusion
- has a physician’s order to concurrently obtain a blood sample for hemoglobin, potassium, and glucose levels; no recent abnormal hemoglobin levels
- no central line through which blood samples are routinely drawn.

Instrumentation: Two visual analog scales (VAS) to measure patient/family satisfaction and distress with two methods of blood draws and a single-item to assess patient/family preference for method of blood draw. The research nurse recorded patient data and IV data on a data collection form.

Data Collection Method
1. After consent/assent, blood samples for hemoglobin, glucose and potassium were drawn by venipuncture.
2. Patient/parent completed two VASs for satisfaction and distress with venipuncture.
3. Blood for hemoglobin, glucose and potassium were drawn from IV per study protocol for clamping and flushing.
4. Patient/parent completed two VASs for satisfaction and distress with blood draw from IV and the single-item regarding preferred method of blood sampling.
5. All blood tests were run at the target hospital’s lab.

Key Results

- Potassium and glucose levels were not statistically significantly different between two blood draw methods.
- Hemoglobin levels were significantly different (t = 10.1, p < .001). Clinical significance of hemoglobin differences was negligible, compared to the margin of error accepted in national laboratory guidelines.
- Patient/family satisfaction was higher and patient distress was lower with the IV blood draw method (p < .001).
- Rate of hemolysis for both methods was not clinically significant, and no IVs occluded.
- Presence or absence of dextrose in the IV fluid did not alter lab results.
- Patients (99%) preferred the IV method.
- Younger participants reported higher distress with the venipuncture method (p < .05).

Data from Table 1:

<table>
<thead>
<tr>
<th>Participant Characteristics (N = 95)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in months (mean, SD, range)</td>
<td>87.2, 62.3, 6-204 months</td>
</tr>
<tr>
<td>Gender (number, %)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>50, 52.1%</td>
</tr>
<tr>
<td>Male</td>
<td>45, 46.9%</td>
</tr>
<tr>
<td>Admitting Diagnosis</td>
<td></td>
</tr>
<tr>
<td>Abdominal/GI</td>
<td>32%</td>
</tr>
<tr>
<td>Respiratory</td>
<td>21%</td>
</tr>
<tr>
<td>Infection (non-abdominal, non-respiratory)</td>
<td>29%</td>
</tr>
</tbody>
</table>

Measure | Mean | SD | Actual Range/ Possible Range |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS #1: Satisfaction with venipuncture</td>
<td>8.2</td>
<td>2.7</td>
<td>1-10/1-10 (higher score=more satisfied)</td>
</tr>
<tr>
<td>VAS #2: Distress with venipuncture</td>
<td>4.9</td>
<td>3.0</td>
<td>1-10/1-10 (higher score=more distress)</td>
</tr>
<tr>
<td>VAS #3: Satisfaction with IV draw</td>
<td>9.5</td>
<td>1.4</td>
<td>4-10/1-10 (higher score=more satisfied)</td>
</tr>
<tr>
<td>VAS #4: Distress with IV draw</td>
<td>1.5</td>
<td>.99</td>
<td>1-5/1-10 (higher score=more distress)</td>
</tr>
<tr>
<td>Hemoglobin per venipuncture/IV draw</td>
<td>12.2/11.8</td>
<td>1.4/1.4</td>
<td>8.9-16.7 (veni) 8.7-15.3 (IV)</td>
</tr>
<tr>
<td>Potassium per venipuncture/IV draw</td>
<td>4.2/4.2</td>
<td>.69/.79</td>
<td>2.8-7.9 (veni) 3.2-7.8 (IV)</td>
</tr>
<tr>
<td>Glucose per venipuncture/IV draw</td>
<td>102.6/103.0</td>
<td>18.7/20.2</td>
<td>61-156 (veni) 61-159 (IV)</td>
</tr>
</tbody>
</table>

Implications for Practice
- Replicate the study in ethnically diverse samples
- Conduct a randomized control trial, with each participant assigned randomly to a blood draw method, rather than all participants experiencing both methods of blood draws.
- Develop guidelines for local hospital policies on methods of drawing blood samples.
- Collect additional outcomes to measure.
- Use local anesthetic agents, since this study documents that venipunctures are painful, especially for children.

Conclusions
- Blood samples can be accurately drawn from existing infusing IVs in pediatric patients, per the study protocol for pausing the IV and flushing.
- No damage to the IV site occurred from drawing blood through the IV, and no contamination of samples drawn from the IV were noted from comparison of lab results across methods.
- Patients prefer the IV blood draw method, reporting higher satisfaction and less distress across all pediatric age and gender groups.

Limitations
- Single site study with a convenience sample
- Drawing venipuncture first could increase stress, glucose and distress.
- Distress ratings may have been influenced by some participants choosing to use anesthetic cream on venipuncture site.
- Hemoglobin may differ slightly between blood draw methods, more so than glucose or potassium for yet unknown reasons.

Future Research
- Replicate the study in ethnically diverse samples
- Conduct a randomized control trial, with each participant assigned randomly to a blood draw method, rather than all participants experiencing both methods of blood draws.
- Explore causes of slight differences in hemoglobin; test different vacutainers and check hemolysis rates.