Equivalence of laboratory values between peripheral venipuncture and samples from newly inserted peripheral intravenous catheters

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Purpose

Determine if blood samples collected when a peripheral intravenous (PIV) line is initiated provide equivalent lab results as blood samples collected from a separate venipuncture.

Hypotheses:

1. The matched blood samples collected from PIV and venipuncture would not be statistically different
2. Clinical equivalence would be present between samples collected from PIV and venipuncture.

Background

The standard of practice at Northern Westchester Hospital (NWH) is to perform a separate venipuncture every time a patient requires blood sampling, even when adequate venous access is in place. Patients frequently ask their nurse to obtain blood samples when placing a new PIV. Patients report they fear the pain and potential bruising from “needle sticks.” Even when the nurses provide education and support and performs a successful venipuncture, patients would prefer fewer “needle sticks.”

Two integrative reviews provided inconclusive evidence on the clinical equivalence of blood sample lab results from PIV and venipuncture to either support or prohibit blood sampling during PIV insertion (Frey, 2003; Halm & Gleaves, 2009). Inconsistencies were related to differences in blood sampling techniques, materials used for blood sampling and research design. These inconsistencies prevent definitive practice recommendations and compel further research to compare blood sample lab results obtained from PIVs and venipunctures.

Discussion

There were three subjects in the study that with peripheral IV insertion, the blood specimens were difficult and slow to draw. In these cases, the hemolysis level was greater than 1. Due to the difficulty with the IV draw, lab specimens in these cases would have been drawn through peripheral venipuncture. With the exception of these cases, the results of this study indicate that clinically equivalent blood samples may be drawn during a PIV insertion.

Limitations

- Excluded patients requiring blood cultures, patients <18 years old, non-English speaking and with arm precautions, limits generalizability.
- The ED Patient Care Manager & Assistant Patient Care Manager collected data to control for technique which may skew results.

Results

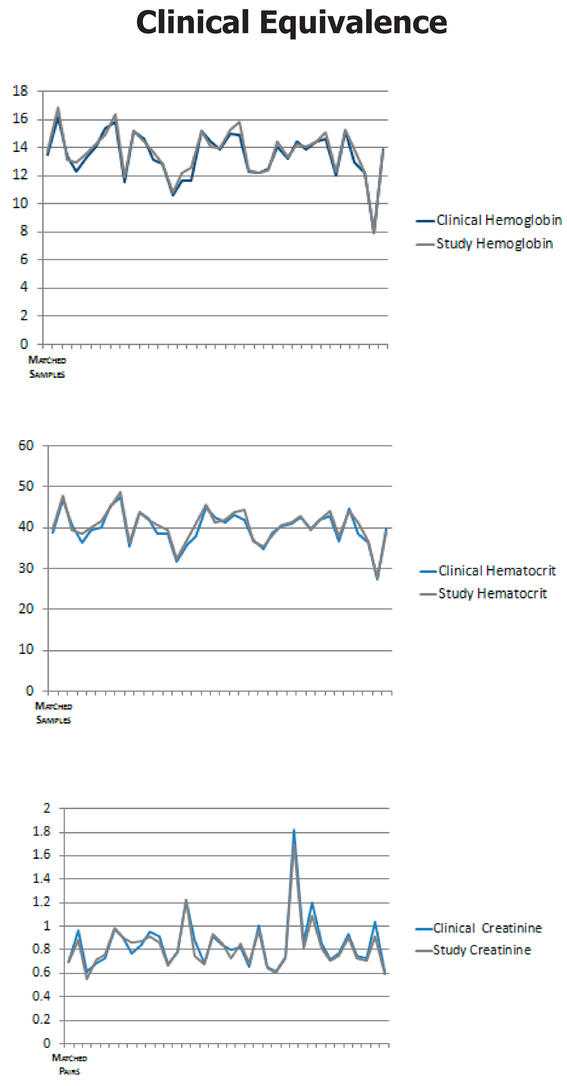
N= 35 patients Mean age 54.5 (SD17.1) years
Mean Venipuncture pain score=2.14
Mean PIV pain score = 2.83
(trended towards significance t=2.01(35) p=.052

No statistically significant differences for:

- White Blood Cells t = -.93 (33) p = .359
- Platelets t = 1.86 (33) p = .072
- Sodium t = -.15 (33) p = .879
- Potassium t = 1.62 (33) p = .115
- Chloride t = 1.72 (33) p = .095
- Carbon Dioxide t = -.69 (33) p = .494
- Glucose t = 1.91 (33) p = .065
- Calcium t = 1.42 (33) p = .164
- PT t = -.87 (25) p = .392
- PTT t = .37 (25) p = .712
- INR t = 1.01 (25) p = .322
- Troponin t = 1.18 (11) p = .262

The following lab results showed statistical differences:

- Red Blood Cells t = 3.04 (33) p = .005
- Hemoglobin t = 3.33 (33) p = .002
- Hematocrit t = 3.15 (33) p = .003
- Blood Urea Nitrogen t = 3.27 (33) p = .002
- Creatinine t = 2.28 (33) p = .029



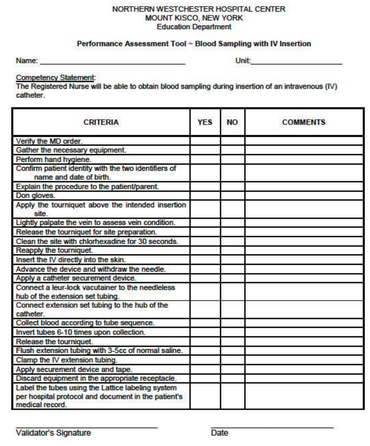
Methods

Prospective, quasi-experimental study recruited patients who required clinical blood samples as part of their routine care. Current NWH standards of practice for blood sample collection and PIV insertion were followed. An additional blood sample was collected when the patient’s PIV line was placed. The patient’s specimens served as their own control to determine if there were statistical and/or clinical differences in laboratory results based on method used to collect the blood specimen.

Paired t-tests with p values = .05 determine statistically significance differences.

If statistical differences were identified between the matched pairs of blood samples, clinical equivalence was evaluated with two separate methods.

1. Bland-Altman analyzed the 95% limits of agreement (LOAs) around the mean differences (mean difference between methods 1.96 [SD])(Bland & Altman, 1986).
2. Clinical Laboratory Improvement Amendment (CLIA) of 1988 (CLIA, 1992), determined the maximum allowable analytical error.



NORTHERN WESTCHESTER HOSPITAL CENTER
MOUNT KISCO, NEW YORK
Education Department

Performance Assessment Tool ~ Blood Sampling with IV Insertion

Name: _____ Unit: _____

Competency Statement:
The Registered Nurse will be able to obtain blood sampling during insertion of an intravenous (IV) catheter.

CRITERIA	YES	NO	COMMENTS
Verify the MD order.			
Gather the necessary equipment.			
Perform hand hygiene.			
Confirm patient identity with the two identifiers of name and date of birth.			
Explain the procedure to the patient/parent.			
Don gloves.			
Apply the tourniquet above the intended insertion site.			
Lightly palpate the vein to assess vein condition.			
Release the tourniquet for site preparation.			
Clean the site with chlorhexadine for 30 seconds.			
Reapply the tourniquet.			
Insert the IV directly into the skin.			
Advance the device and withdraw the needle.			
Apply a catheter securement device.			
Connect a leur-lock vacutainer to the needleless hub of the extension set tubing.			
Connect extension set tubing to the hub of the catheter.			
Collect blood according to tube sequence.			
Invert tubes 6-10 times upon collection.			
Release the tourniquet.			
Flush extension tubing with 3-5cc of normal saline.			
Clamp the IV extension tubing.			
Apply securement device and tape.			
Discard equipment in the appropriate receptacle.			
Label the tubes using the Lattice labeling system per hospital protocol and document in the patient's medical record.			

Validator's Signature _____ Date _____

References

Frey, A. M. (2003). Drawing blood samples from vascular access devices: Evidence-based practice. *Journal of Infusion Nursing, 26*(5), 285-293.

Halm, M. A., & Gleaves, M. (2009). Obtaining blood samples from peripheral intravenous catheters: best practice? *American Journal of Critical Care 18*(5), 474-478. doi: 10.4037/ajcc2009686

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Bland, J. M., & Altman, D. G. (1986). Statistical methods for assessing agreement between two methods of clinical measurement. *Lancet, 1*, 307-310.

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