Reducing Discard Blood Draw Volumes from Subcutaneously Implanted Ports (PORT) in Patients with End Stage Renal Disease (ESRD)

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Reducing Discard Blood Draw Volumes from Subcutaneously Implanted Ports (PORT) in Patients with End Stage Renal Disease (ESRD)

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Background
- To monitor clinical status, dialysis and transplant patients with ESRD frequently require blood draws.
- To preserve their veins and to avoid frequent intravenous access, these patients, especially young children, require PORT placement.
- The PORT is flushed with saline and filled with heparinized saline to prevent blood clotting between blood draws.
- To avoid contamination from PORT fluids, a fixed amount of blood is withdrawn and discarded before the blood sample is drawn for laboratory analyses. Currently, the recommended discard blood volume is 5 mL (five times the reservoir volume of most PORTs and attached catheters.)
- The volume of discarded blood can be significant, particularly in young patients with ESRD who are already anemic and who receive Epogen and iron therapy. This can be a leading cause of iatrogenic anemia.
- In this study, we evaluated the possibility of reducing the discarded blood volume from 5 mL to 3 mL without compromising laboratory results.

Objective
- To determine if a decrease in the discarded volume from 5 mL to 3 mL will still provide accurate and valid lab results for the two most commonly obtained clinical tests, complete blood count (CBC) and basic metabolic profile (BMP).

Material and Methods
- Twelve patients with CKD who had a PORT placed as part of their clinical care were included in the study after obtaining informed consent.
- Blood specimens for CBC and BMP were obtained for clinical indications only.
- Fifty paired blood specimens were obtained between February and October 2017.
- Blood specimens were obtained sequentially: study blood specimen \( S \) was obtained after a discard volume of 3 mL, followed by any additional blood draw equal to \( 5 - (3 + S \) mL), followed by control blood specimen \( C \).
- The chemistry (BMP) samples were analyzed on a Vitros® analyzer and hematology (CBC) samples were analyzed on a Sysmex® analyzer.
- The agreement and variability between the results of the study \( S \) and the control \( C \) specimens were analyzed by regression analysis (coefficient of determination and line of equality), and Bland Altman analysis.
- Variability limits for most analytes were set as one-third of the difference between the reference range for that particular analyte (red lines).
- Statistical analysis was performed using MedCalc Statistical Software version 18.2.1, Ostend, Belgium.

Results
- The coefficient of determination \( (R^2) \) for all of the tested analytes was \( \geq 0.9 \) with the exception of bicarbonate \( (0.75) \); \( p \) for all \( <0.001 \).
- The line of equality slope was \( \geq 0.88 \) \( (p<0.001) \) for all tested analytes.
- On Bland Altman analysis, with the exception of 6 outliers out of 550 paired lab values, the difference between the control and study sample values tested against the control values were within the preset variability limits.

Conclusion
- The study specimen results showed a high degree of correlation \( (R^2) \) on regression analysis and a slope approximating 1 \( (x = y) \) on the line of equality.
- There was a very high degree of agreement between control and study specimen results on Bland Altman analysis. Only 6 (1%) of the results were outside the preset clinically acceptable limits.
- Our results suggest that for at least CBC and BMP, the discard blood volume can be safely decreased from 5 to 3 mL, a 40% decrease in blood wastage without impacting the validity and accuracy of the results.

References

Regression Analysis and Bland Altman Analysis