Correlation of arterial and venous lactate and base deficit values
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Introduction
- Arterial and venous blood gases are frequently monitored in the ICU and operating room to evaluate oxygenation, ventilation, cardiac output, and peripheral perfusion.
- Depending on the site of monitoring, variations in the pH, base deficit, and lactate values may be noted.
- In the adult patient in the ICU or emergency department, a clinically acceptable correlation has been noted between pH, base deficit (BD), and lactate.1 2
- There are no studies evaluating intraoperative correlations and limited data in the pediatric population.3
- Furthermore, there are no studies simultaneously comparing arterial, peripheral venous, and central venous values.
- Given the utility of these measurements in guiding the clinical care of critically ill patients and guiding therapy, this study attempts to describe the correlation of arterial and venous values.

Methods
- A prospective cross-sectional study on pediatric patients intraoperatorily comparing pH, base deficit, and lactate of simultaneously obtained venous and arterial samples.
- Inclusion criteria: patients undergoing anesthetic care with a central or peripheral venous cannula and an arterial cannula were eligible.
- Exclusion criteria: presence of intracardiac shunting or residual congenital heart disease
- As clinically indicated, when an arterial sample was obtained, a simultaneous sample was obtained from a central venous catheter or peripheral venous cannula for routine blood gas analysis and lactate.
- Correlations of values of BD and lactate were assessed using Pearson’s correlation coefficient and Bland-Altman plots.
- Least-squares regression was used to determine change in each venous value corresponding to a unit change in the arterial value.
- Differences between venous and arterial values were assessed using paired t-tests.

Results & Discussion
- The study cohort included 19 patients with an age of 11.5 ± 6.2 yrs and a weight of 40.9 ± 22.4 kg.
- The arterial BD (0.7; ± 3.2) exhibited no significant difference from venous BD (1.4 ± 2.5µmol/L, paired t-test p=0.157).
- The arterial lactate (1.0 ± 0.5) also exhibited no significant difference from central venous lactate (1.0 ± 0.5µmol/L, p=0.095).
- Pearson correlation coefficients demonstrated a very high correlation between arterial and venous BD (r=0.81, p<0.001) and between arterial and venous lactate (r=0.84, p<0.001).
- Bland-Altman plots of arterial and venous BD showed all 2 observations to fall within the 95% limits of agreement (Figure 1).
- Bland-Altman plots of arterial and venous lactate showed all but 1 observation to fall within the 95% limits of agreement (Figure 2).
- Least-squares regression indicated that a 1-unit increase in arterial BD corresponded to a 0.6-unit (95% CI: 0.4, 0.9) increase in venous BD (p<0.001) and a 1-unit increase in arterial lactate corresponded to a 0.9-unit (95% CI: 0.7, 1.1) increase in venous lactate (p<0.001).

Conclusions
- Our data demonstrate that BD and lactate values obtained from arterial and venous sampling sites demonstrate a clinically acceptable correlation.
- These data support that real-time measurements of base deficit or lactate in either arterial or venous samples may be used to guide therapy in the pediatric population during both the intraoperative and postoperative period.

References