NONINVASIVE HEMOGLOBIN MEASUREMENT IN PEDIATRIC TRAUMA PATIENTS.

J Trauma Acute Care Surg. 2016 Jul 6. [Epub ahead of print]

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INTRODUCTION: Hemorrhage is a major cause of preventable death secondary to traumatic injury. Diagnosis often requires multiple blood draws, which are psychologically stressful in pediatric patients. The Pronto device is a pulse co-oximeter that measures the total hemoglobin level using multiple wavelengths of light. The purpose of this study was to evaluate the accuracy of the noninvasive hemoglobin measurements relative to current invasive and point of care testing methods in pediatric trauma patients.
METHODS: We performed a prospective observational trial involving patients under age 17 presenting to a Level I pediatric trauma center. Following admission, blood was sampled from each patient for testing using an i-Stat device (point-of-care hemoglobin) and a complete blood count within our core lab (invasive hemoglobin). Noninvasive hemoglobin analysis was performed within 15 minutes of phlebotomy. Data was evaluated using Spearman correlation and Bland-Altman analysis.
RESULTS: Over 2 years, 114 patients had attempted noninvasive hemoglobin measurements, with a success rate of 89%. Mean ± SD age was 9.2 ± 5.1. Ninety percent of admissions were for blunt injury, three percent penetrating, five percent near-drowning, and one percent burns. Mean invasive hemoglobin was 12.6 ± 1.9, mean point-of-care hemoglobin was 12.2 ± 2.0, and mean noninvasive hemoglobin was 12.3 ± 1.6. Noninvasive hemoglobin values were strongly correlated with both invasive and point of care measurements ($R = 0.672$ and 0.645, respectively, $p<0.001$). Bland-Altman analysis comparing noninvasive to point-of-care and invasive hemoglobin levels resulted in an estimated bias of -0.39 and -0.49, respectively.
CONCLUSION: Noninvasive hemoglobin values had excellent correlation with both invasive and point-of-care hemoglobin measurements, though the device was not successful for all patients. Given the rapid availability of results and the lack of requirement of venipuncture, noninvasive hemoglobin monitoring may be a valuable adjunct in the initial evaluation and monitoring of pediatric trauma patients.