

Noninvasive and Continuous Hemoglobin Monitoring in an Intensive Care Unit Patient with Low Hemoglobin.

Juhl A., Naqvi S., Aregbeyen O., Shander A. *Proceeding for the Society for the Advancement of Blood Medicine 2010 Annual Meeting.* Abs 4323.

Introduction

Traditional invasive hemoglobin methods contain many drawbacks including their intermittent nature which may contribute to unnecessary blood transfusions and excessive blood loss contributing to iatrogenic anemia.¹ EHMC is a leading hospital that practices Patient Blood Management (PBM). PBM is a multi-modality approach to minimize the risk of blood loss and unnecessary blood transfusions to improve patient outcomes. Noninvasive and continuous hemoglobin monitoring is now available and has the potential to result in fewer blood draws and improved clinical management, especially in patients with very low hemoglobin values (<8 g/dL). This report describes a case of one patient over the course of 4 days in the intensive care unit (ICU) at a hospital practicing PBM, measuring both invasive hemoglobin (tHb) and noninvasive continuous hemoglobin (SpHb).

Methods

An 84 y/o female patient being treated for pneumonia was admitted to the ICU with a hemoglobin value of 5.3 g/dL. Once enrolled in this IRB-approved study, a Rainbow R2-25 ReSposable sensor (Rev E), attached to a Pulse CO-Oximeter (Radical-7, Masimo Corporation, Irvine, CA) was placed on the patient's left middle finger, on the hand opposite the blood pressure cuff. The Pulse CO-Oximeter was attached to a laptop computer for the continuous recording of SpHb, pulse rate (PR), oxygen saturation (SpO₂) and perfusion index (PI) at one data point per second, for the duration of the patient's stay. The data were recorded for a period of 4 days (total of 92 hours) then downloaded into Excel for analysis. During the patient's ICU stay, six invasive venous blood samples were obtained and the time of each blood sample was recorded. Blood samples were analyzed with a Beckman Coulter Counter LH 750 Analyzer. Laboratory hemoglobin values and continuous SpHb values were plotted against time to evaluate trending.

Results

The tHb ranged from 5.2 to 8.1 g/dL in 6 measurements over 4 days and the continuous SpHb measurements ranged from 4.9 to 11.2 g/dL over 4 days. Compared to the intermittent measurements of tHb, the bias of SpHb was 1.26 g/dL and the standard deviation was 0.43 g/dL. Figure 1 shows the SpHb and tHb measurements over 4 days in the ICU.

Conclusion

In this case, noninvasive continuous hemoglobin monitoring with SpHb exhibited a consistent trend compared to the changes in laboratory hemoglobin measurements over a period of four days. The ability to continuously monitor hemoglobin noninvasively may offer a new and effective strategy to facilitate blood conservation efforts and manage transfusions in the ICU and a variety of other medical application

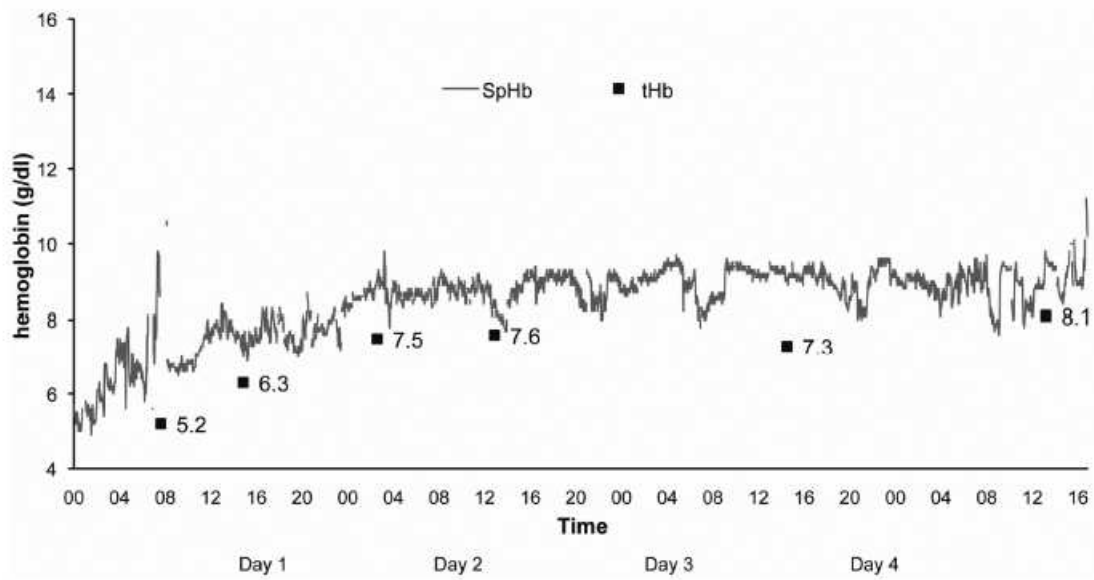


Figure 1. SpHb and tHb measurements over 4 days in the ICU

References

1. Smoller BR, et al., N Engl JMed. 1986;314:1233-5.