Continuous Noninvasive Hemoglobin Measurement in Cardiac Surgical Patients.
Yao A., Dastrange M., Fleming N.W. *Proceedings of the 2010 Annual Meeting of the American Society Anesthesiologists.* Abs. 670.

Introduction

The ability to immediately and continuously measure hemoglobin concentration has the potential to reduce or even obviate costly blood draws that at best provide intermittent and delayed results. In 2009, Masimo Corporation introduced technology (Masimo SpHb) that noninvasively measures hemoglobin levels using multi-wavelength pulse oximetry. Our initial experience with this device was promising but inconsistent results were observed in cardiac surgery patients. The Masimo SpHb sensor has since undergone several updates, and we now report our cumulative experience with this device. The purpose of this study was to compare the correlation coefficients and Bland-Altman bias of successive device revisions.

Methods

Following IRB approval, fifty-five adult patients undergoing cardiac surgery requiring cardiopulmonary bypass (CPB) were evaluated. These patients received the typical standard and invasive monitors used for CPB procedures at our institution; in addition, a SpHb adhesive finger sensor was placed. Continuous SpHb data was collected from this probe using software supplied by the manufacturer. Arterial blood samples were drawn when clinically indicated; resulting laboratory CO-Oximeter-measured hemoglobin levels (ABG Hgb) were recorded and retrospectively compared with the corresponding SpHb reading.

Results

A total of 228 data pairs were collected from 55 patients over three device revisions (Versions A, C and E). The statistical results are detailed in the following chart and graphs.

Conclusions

Continuous noninvasive hemoglobin measurement (SpHb) has substantially improved in accuracy since its introduction in 2009. Preliminary results using the most recent iteration of the device are promising and suggest that SpHb may be a feasible alternative to invasive hemoglobin monitoring. Additional studies are needed to further characterize its reproducibility and accuracy in a wider range of both surgical and nonsurgical patients.

Statistical Analysis			
	Version A	**Version C**	**Version E**
# Patients	24	23	8
# XY Pairs	90	94	44
R-squared (linear regression)	0.436	0.127	0.683
p value (Pearson correlation)	[start_en]003C; 0.0001	0.0004	[start_en]003C; 0.0001
Bias (Bland-Altman)	0.421	0.711	-0.01364
SD of bias	1.6	2.39	1.085

Figure 1