Print Close

A2282
October 13, 2013
2:00:00 PM - 3:00:00 PM
Room Room 104-Area D

Continued Improvement in Absolute and Trend Accuracy of Non-Invasive and Continuous Hemoglobin Monitoring

Richard Applegate, M.D., Carl Collier, D.O., Mark Macknet, M.D., Mohammad Hassanian, M.D., Gerald Andrews, M.B.,B.S., Michael Um, B.S.
Loma Linda University School of Medicine, Loma Linda, California, United States

Background

Hemoglobin (Hb) measurement informs red blood cell transfusion decision-making with lab Hb considered standard. Excessive sampling is identified as a source of blood loss.1,2 Noninvasive continuous hemoglobin monitoring with Pulse CO-Oximetry (SpHb) is available. Noninvasive Hb measurement must be within acceptable accuracy limts,3 and trend the same direction as lab Hb4 to guide transfusion. We reported on absolute and trend accuracy of revision E SpHb monitoring during major surgery.5 SpHb technology has undergone several software and sensor revisions, with incremental performance improvement. Our objective was to study absolute and trend accuracy of revision K SpHb adhesive sensor and software.

Methods

Ongoing IRB approved investigator initiated trial. Consenting adult patients scheduled for surgery in which expected blood loss represented a significant portion of estimated blood volume were enrolled. ASA standard monitors and an arterial catheter for blood pressure monitoring and blood sampling were used, as is our practice for these patients. A shielded SpHb Resposable sensor (R2-25, revision K) connected to a Radical-7 Pulse CO-Oximeter (SET sw ver. 7910, Masimo, Irvine CA) was placed on a finger of either hand. SpHb data was continuously recorded to a computer. Time matched SpHb and arterial blood gas CO-Oximetry determined hemoglobin (ABG Hb; ABL-800, Radiometer, Copenhagen, Denmark) samples were obtained at the discretion of the anesthesiologist. SpHb to ABG Hb was analyzed for: bias of SpHb - ABG Hb; linear regression analysis (R2); Bland Altman limits of agreement; and linear regression of paired changes in sequential measurements of SpHb to ABG Hb (JMP 10.0.0, SAS Institute, Cary, NC, USA).

Results

Analysis to date: 2 patients excluded for equipment failure; 100 SpHb-ABG Hb measurements were collected from 22 patients. Compared to results from sensor revision E in the same population,5 Rev K shows improved accuracy (bias -0.47±0.96 g/dL vs Rev E 0.5±1.4g/dL). For 13 pairs when ABG Hb ≤9 g/dL, bias was 0.0±0.4 g/dL. Linear regression analysis (Fig 1) showed higher correlation (R2 0.67 vs Rev E 0.48); Bland Altman plot (Fig 2) showed narrower limits of agreement (-2.4 to 1.4 vs -2.3 to 3.3 g/dL); and regression analysis (Fig 3) of 77 sequential changes showed higher correlation (R2 0.51 vs Rev E 0.31). SpHb increased in only 2 of 20 samples in which the sequential decrease in Hb was >1 g/dL; 1 when ABG Hb <10 g/dL.

Discussion

During major surgery the revision K SpHb sensor showed improved absolute and trend accuracy compared to the revision E sensor. Our data suggests better performance at ABG Hb <9 g/dL, but the small number of values in this range limits analysis. If shown to be accurate in this range, SpHb could contribute to patient safety by providing continuous data on changes in hemoglobin in patients who are more likely to need transfusion if surgical bleeding continues. Further research is needed to determine if this improvement in SpHb is sufficient to guide transfusion decisions during surgery in which large blood loss is likely.

1Crit Care Med 2003; 31:S715

2J Perinatol. 2005;25:21

3Anesth Analg. 2011;112:858

4Ann Emerg Med. 2011;57:330

5Anesthesiology 2012;116:65

Figure 1

	Count o
Gender # Female; Male	
Age years	57.
Weight kg	82.
Body mass index kg/m^2	28
Number of ABG samples during surgery	4.
Estimated blood loss ml	58
ABG Hb	11
Table: patient characteristics; results shown as count	

Figure 2

Figure 1

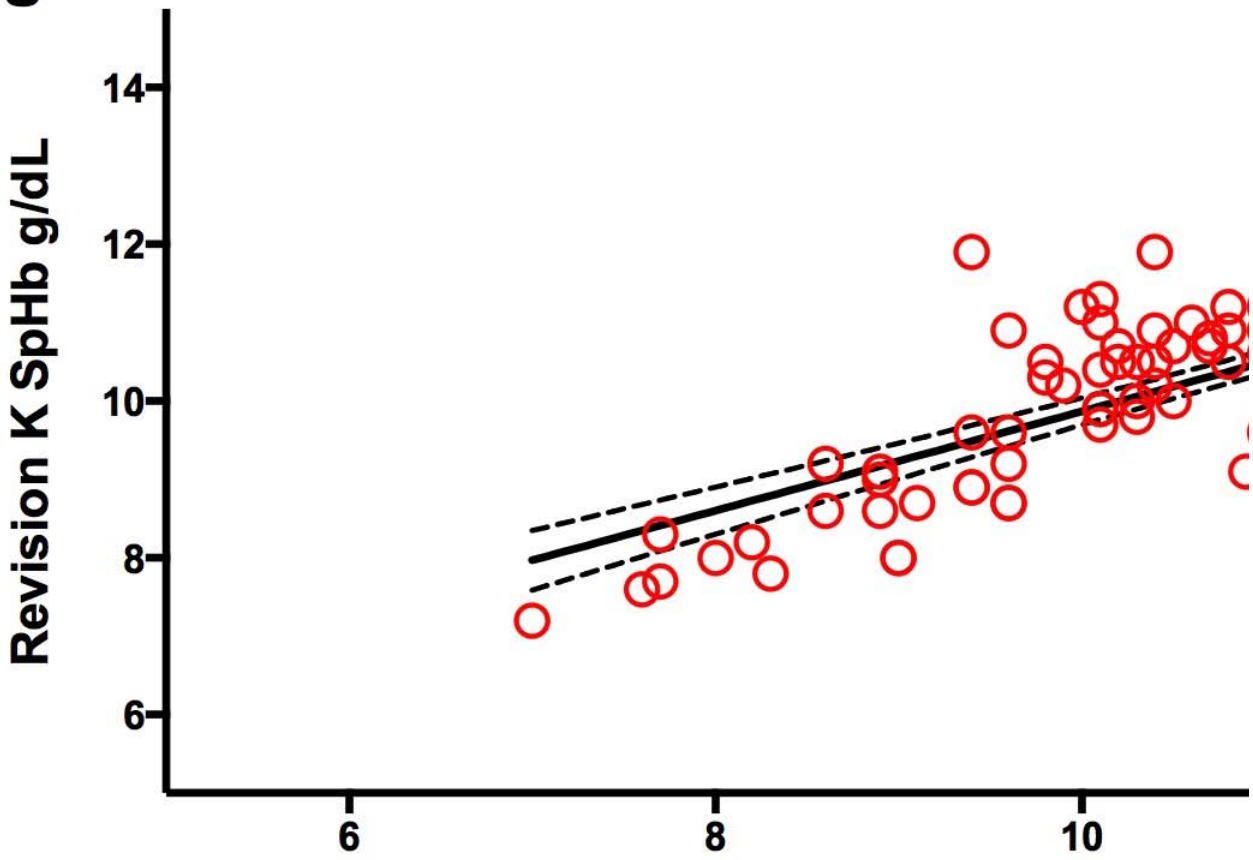
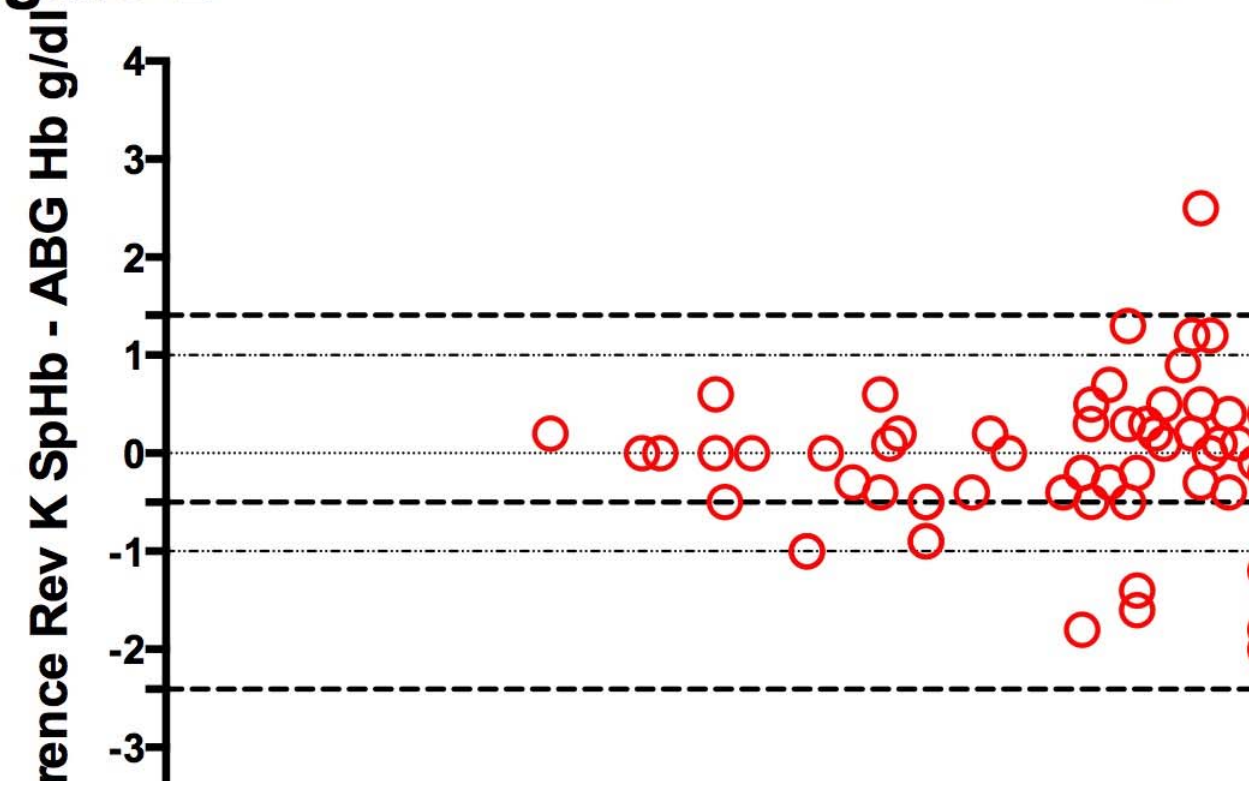


Figure 2



Copyright © 2012 American Society of Anesthesiologists

Filename:	G=2Vwudqgv2Frqwhqw2DVD2dvddevwudfw253462Htxlsp hqw#P rqlwruhjj#dqg#Hqjlqhuhjj#Whfkqrorj|2devbd7<<31kwp