Evaluation of Pulse Cooximetry in Patients Undergoing Abdominal or Pelvic Surgery.
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Anesthesiology. 2012 Jan;116(1):65-72.

Background
Intraoperative transfusion decisions generally are guided by blood loss estimation and periodic invasive hemoglobin measurement. Continuous hemoglobin measurement by Pulse CO-Oximetry (pulse hemoglobin; Rainbow® SET Pulse CO-Oximeter, Masimo Corporation, Irvine, CA) has good agreement with laboratory hemoglobin in healthy volunteers and could aid transfusion decision-making. Because intraoperative physiology may alter performance of this device, this study investigated pulse hemoglobin during surgery.

Methods
Ninety-one adult patients undergoing abdominal or pelvic surgery in which large blood loss was likely were studied. Time-matched pulse hemoglobin measurements were recorded for each intraoperative arterial hemoglobin measurement obtained. Agreement between measurements was assessed by average difference (mean ± SD, g/dl), linear regression, and multiple measures Bland-Altman analysis.

Results
The average difference between 360 time-matched measurements (bias) was 0.50 ± 1.44 g/dl, with wider limits of agreement (-2.3 to 3.3 g/dl) than reported in healthy volunteers. The average difference between 269 paired sequential pulse and arterial hemoglobin changes was 0.10 ± 1.11 g/dl, with half between -0.6 and 0.7 g/dl of each other. The bias was larger in patients with blood loss of more than 1,000 ml; hemoglobin less than 9.0 g/dl; any intraoperative transfusion; or intraoperative decrease in arterial hemoglobin at the time of sampling ≥2 g/dl (all $P < 0.001$). The range of bias was narrower at deeper anesthesia ($P < 0.001$).

Conclusions
Evaluation of the sensor and software version tested suggests that although Pulse CO-Oximetry may perform well in ambulatory subjects, in patients undergoing surgery in which large blood loss is likely, an invasive measurement should be used in transfusion decision-making.