

Clinical Decision Levels for Lab Tests

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TRANSLATIONAL RESEARCH

Usefulness of non-invasive spectrophotometric haemoglobin estimation for detecting low haemoglobin levels when compared with a standard laboratory assay for preoperative assessment

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Editor's key points

- Instant non-invasive haemoglobin (Hb) measurement has potential to accelerate clinical decision-making.
- Spectrophotometric haemoglobin (SpHb) was compared with standard invasive testing in more than 700 patients.
- SpHb was good at identifying low Hb in males, but less so in females.
- Precision was unacceptable.
- SpHb is useful as a screening tool but needs subsequent measurement of Hb by standard techniques to guide clinical decisions.

Background. Delay in diagnosis of anaemia during preoperative assessment poses logistic problems, leading to multiple clinic visits, inadequate preoperative management, and unnecessary delay of surgery. Therefore, we tested an instant spectrophotometric haemoglobin (SpHb) measurement technique to facilitate this assessment.

Methods. We evaluated portable instant SpHb vs standard laboratory screening of anaemia between March 2012 and December 2013. Paired Hb measurements were performed on 725 patients using SpHb (Preito-7, Mesimo Corporation, Irvine, CA, USA) and Hb measured on the same day using an automated analyser. The results were obtained from a group of 638 patients from the pre-anaesthetic clinic with expected normal Hb values, and 88 patients from the oncology clinic with known low Hb.

Results. Median (range) SpHb was 129.5 (67–171) compared with 136 g litre⁻¹ (63–178) Hb measured using the automated system. Identifying Hb below a threshold of 130 g litre⁻¹ for males had a high sensitivity (93%), while identifying a threshold of 120 g litre⁻¹ for females had lower sensitivity (75%). The specificity for males (77%) and females (81%) was similar. Mean measurement bias and agreement: tolerability interval ratio was -8.1 g litre⁻¹ and 2.78 for men and -3.1 g litre⁻¹ and 2.44 for women.

Conclusions. SpHb was sensitive as a preliminary screening tool for detecting true low Hb values in males, but less sensitive in females. Instant SpHb measurement may enable prompt routine preoperative anaemia management, but its precision was lower than expected.

Clinical trial registration. This study is approved by the Tasmanian Human Ethics Committee, Australia and was registered prospectively in the Australian and New Zealand Clinical Trials Registry (<http://www.ANZCTR.org.au/> ACTRN12611001256965) and the World Health Organization Clinical Trials Registry (<http://apps.who.int/trialsearch/trial.aspx?trialid=ACTRN12611001256965>).

Keywords: laboratory Hb; pre-anaesthetic clinic; preoperative anaemia; preoperative screening; spectrophotometric Hb

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Haemoglobin (Hb) assessment is one of the most common laboratory tests performed, with an estimated 400 million tests yearly.^{1, 2} The value of a reliable and convenient clinical method to measure Hb in patients who are undergoing major operative procedures³ is clearly established. An ideal method for clinical use should be easy to perform, accurate, reproducible, fast, and cost-effective.

The standard measurement of Hb involves either venepuncture, and to a lesser extent fingerprick, both of which are invasive methods that may cause pain and create a potential risk of infection for patients, and of needle-stick injury for clinical staff.^{1, 2} In addition, the laboratory-based standard Hb test entails cost (transportation and processing) and some delay in the reporting of results. Using an instant non-invasive

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