

Evaluation of a pulse oximeter sensor tester

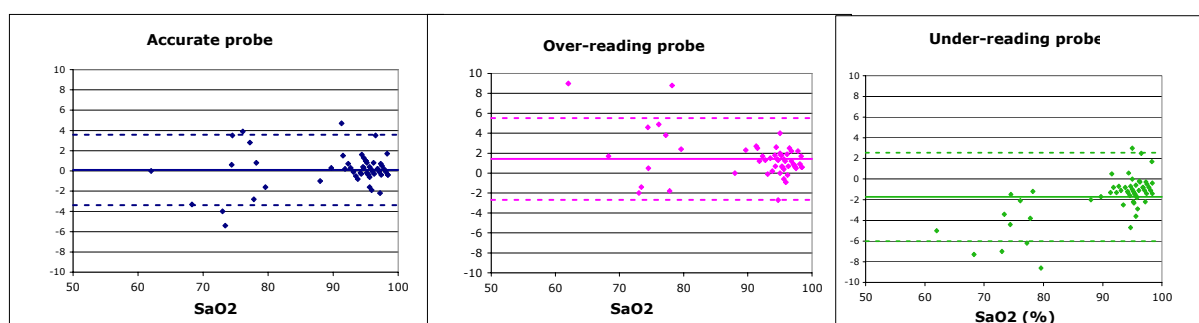
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A potential limitation associated with the use of pulse oximeters,¹ is variation in the wavelength of the light emitting diode (LED).² The Lightman (The Electrode Co. Usk, Wales) is a microspectrometer intended to test pulse oximeter sensors. The manufacturer claims that the Lightman tests LED wavelength accuracy in isolation from the monitor. We decided to evaluate the Lightman predictions against the blood gas analyser (gold standard).

It was the local research ethics committee opinion that this study did not require formal approval. We conducted a prospective, observational study on 32 patients requiring intensive or high dependency care. This study was designed to collect paired, triplicate data. We used three pulse oximeter probes in our study. These probes had been tested using the Lightman and were indicated to be accurate, under-reading and over-reading. Data were collected from all three probes and the arterial blood gas analyser simultaneously from patients. The data collection points were strictly governed by clinical need of the patient.

Our findings are presented in Figure 1. We analysed data from 57 data collection points. The bias [95% Confidence interval] for accurate, over-reading and under-reading probes were 0.1% [\pm 0.45], 1.4 % [\pm 0.53] and -1.7 % [\pm 0.56] respectively.

Figure 1. Bland and Altman agreement plots between the Lightman tested probes (S_pO_2) and co-oxymeter (S_aO_2); x axis values: $(S_aO_2 + S_pO_2)/2$, — bias, --- limits of agreement



Our findings suggest that the Lightman can detect the faulty probes and predict reasonably accurately the direction of the probe's error. The error appears to be smaller at higher saturation levels, but at lower saturation levels the variability of the probes appears to increase, e.g. the over-reading probe can over estimate the oxygen saturations by up to 9%. Pulse oximeters are often used to guide therapeutic interventions and this variability is potentially clinically significant. Medical Physics Departments do not test optical properties of the probes [3]. A survey in our hospital using the Lightman found 11% (11/100) of the probes to be faulty [3]. The Lightman may facilitate the removal of faulty probes from the clinical environment.

1. Grace RF. Medical Journal of Australia 1994; 160: 638 – 644; 2. Kellher JF. J Clin Monitoring 1989; 5: 36-7; 3. Fletcher M et al. 18th DoctorsUpdates Jan 2007

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