Response to 'Randomised crossover study on pulse oximeter readings from different sensors in very preterm infants' by Maiwald *et al*

We read with great interest the study of Maiwald *et al*,[1] which compared pulse oximeter saturation (SpO_2) measurements and the proportion of time spent within the designated SpO_2 target range (90%–95%) using three Masimo sensors in extremely preterm infants. However, we disagree with the authors' stated conclusions that Low Noise Cabled Sensors (LNCS) are preferable to Red Diamond Signal Extraction Technology (RD SET) sensors or that the data reveal a concern to clinical care in neonates. This interpretation is not supported by the data shown in the paper, which did not include arterial blood saturation (SaO_2) values, and is impacted by additional methodology shortcomings.

The authors' conclusions de-emphasise the importance of sensor accuracy in SpO_2 targeting. Indeed, clinicians should adjust their management protocols to use the pulse oximeter sensor that most closely reflects the true SaO_2 values. The newer RD SET sensor is designed with improved accuracy specifications (1.5% root-mean-square error [A_{RMS}]), and has been validated against actual blood SaO_2 values. When targeting tighter ranges, higher precision is of importance.

Besides failure to use SaO_2 data to determine accuracy, the authors did not reference shielding measures. When comparing multiple sensors simultaneously, it's important to use optical shielding to prevent sensor-to-sensor crosstalk.[2] Furthermore, the data presented in supplemental figures raise concerns about SpO_2 stability and outlier treatment in the statistical methods used.

We did find the authors' graphical illustration of counts for all SpO_2 values to be instructive. In review of this figure (annotated in figure 1), the RD SET sensor clearly shows a tighter distribution of SpO_2 values, that (contrary to authors' conclusions) is most useful to safely guide fraction of inspired oxygen (FiO_2) titration in premature infants. The figure provided histograms of SpO_2 values from the three sensors studied, and showed RD SET (dashed line) provided a narrower distribution with a clearer peak in the histogram. In the absence of a true SaO_2 reference to make an accuracy statement, the tighter distribution of SpO_2 values using the RD SET implies that it would be best for SpO_2 targeting protocols, since FiO_2 values are titrated to changes in SpO_2 values.

In summary, we found the conclusions stated by Maiwald *et al*[1] are prone to misrepresentation, potentially diverting clinician focus from recent performance improvements in pulse oximetry. In particular, they could drive neonatologists away from using RD SET, when neonatologists should be encouraged to use this sensor due to its increased accuracy. All three Masimo sensors (RD SET, LNCS and PPG) can be safely used to monitor neonates. However, RD SET represents industry leading accuracy (1.5% A_{RMS}), that has translated into a tighter distribution of SpO_2 values observed by these investigators in their SpO_2-targeting protocol.

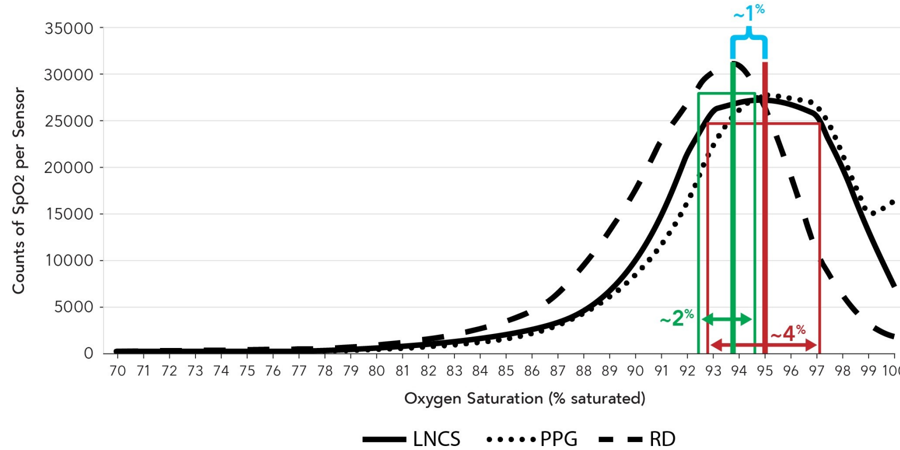

Figure 1 Counts of SpO_2 values per sensor in all infants. The peak count (mode) indicates the difference (bias) between sensors is ~1% (blue), and taking the top 10% of peak counts, the RD with higher precision shows an SpO_2 range spread of ~2% (green) versus ~4% for LNCS (red). Adapted from Maiwald *et al*, 2023.[1]

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