How Accurate Is Pulse Oximetry in Measuring the Heart Rate (HR) of Newly Born Infants?

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Background

HR is important in assessing newly born infants. Guidelines recommend assisted ventilation when HR < 100 bpm. Pulse oximetry (PO) is widely used to measure oxygen saturation and HR in the delivery room (DR). However there are no reports of the accuracy of oximetry measurement of HR in the minutes following birth. *Objective*: To compare HR measured by PO with three lead ECG monitoring in the DR.

Methods

Immediately after birth a Masimo sensor was placed on an infant's wrist whilst ECG leads were applied to the infant's chest. Screens from a Masimo oximeter and ECG monitor were captured by video camera. Two researchers reviewed the archived videos independently. At 2 second intervals one researcher recorded HR (HROX) and signal quality from the oximeter whilst the second recorded HR (HRECG) from the ECG monitor. The relationship between HROX and HRECG measurements was examined using the Bland Altman method. Sensitivity and specificity of PO for the detection of HR < 100 bpm was calculated.

Results

Ninety two deliveries were recorded. Thirty seven were excluded: ECG malfunction (20), PO malfunction (12) and video camera malfunction (5). Fifty five infants: mean (SD) gestational age 35 (3.7) weeks and birth weight 2399 (869)g were investigated. After filtering for signal quality, 5818 data pairs were analyzed. Bland Altman analysis (Fig 1.) shows a mean difference in HR of -1.9 bpm and 2SD of 26 bpm. The sensitivity and specificity of the PO in detecting HR <100 bpm were 99.5% and 95.2% respectively. The positive and negative predictive values were 99.5% and 94.4% respectively.

Conclusions

On average, measurement of HR by Masimo PO matched ECG HR. PO measurement error most commonly occurred at HR > 100 bpm. PO using the Masimo oximeter showed high sensitivity in identifying infants requiring intervention i.e HR <100 bpm.