

### **Variability in time delay between two models of pulse oximeters for deriving the photoplethysmographic signals.**

Foo J.Y., Wilson S.J., Dakin C., Williams G., Harris M.A., Cooper D. *Physiol Meas.* 2005 Aug;26(4):531-44.

Pulse oximetry is commonly used as an arterial blood oxygen saturation (SaO<sub>2</sub>) measure. However, its other serial output, the photoplethysmography (PPG) signal, is not as well studied. Raw PPG signals can be used to estimate cardiovascular measures like pulse transit time (PTT) and possibly heart rate (HR). These timing-related measurements are heavily dependent on the minimal variability in phase delay of the PPG signals.

Masimo SET Rad-9 and Novamatrix Oxypleth oximeters were investigated for their PPG phase characteristics on nine healthy adults. To facilitate comparison, PPG signals were acquired from fingers on the same hand in a random fashion.

Results showed that mean PTT variations acquired from the Masimo oximeter (37.89 ms) were much greater than the Novamatrix (5.66 ms). Documented evidence suggests that 1 ms variation in PTT is equivalent to 1 mmHg change in blood pressure. Moreover, the PTT trend derived from the Masimo oximeter can be mistaken as obstructive sleep apnoeas based on the known criteria. HR comparison was evaluated against estimates attained from an electrocardiogram (ECG). Novamatrix differed from ECG by 0.71±0.58% (p<0.05) while Masimo differed by 4.51±3.66% (p>0.05).

Modern oximeters can be attractive for their improved SaO<sub>2</sub> measurement. However, using raw PPG signals obtained directly from these oximeters for timing-related measurements warrants further investigations.