

## **Hemodynamic Monitoring by Smartphone-Preliminary Report from a Comparative Prospective Observational Study**

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**Background:** Advanced hemodynamic monitoring supports making therapeutic decisions in critically ill patients. New technologies, including mobile health, have been introduced into the hemodynamic monitoring armamentarium. However, each monitoring method has potential limitations-content, technical and organizational. The aim of this study was to assess the comparability between measurements obtained with two arterial pressure cardiac output methods: Capstesia™ smartphone hemodynamic software (CS) and LiDCO Rapid™ uncalibrated hemodynamic monitor (LR).

**Methods:** The initial analysis included 16 patients in the period 06-09 2020 without limitations that could make the results obtained unreliable. Eighty pairs of cardiac output measurements were obtained. The comparability of cardiac output results obtained with both methods was assessed using the Spearman's rank correlation coefficient (R), the intra-class correlation (CCC) and the Bland-Altman curves analysis (B-A).

**Results:** The median (IQR) cardiac output measured with CS and LR were 4.6 (3.9-5.7) and 5.5 (4.6-7.4) L min<sup>-1</sup>, respectively. In the B-A analysis, CS cardiac output values were on average 1.2 (95% CI -2.1-4.4) L min<sup>-1</sup> lower than LR values. The correlation between cardiac output with CS and LR was moderate ( $r = 0.5$ ;  $p = 0.04$ ). After adjusting for the presence of the dicrotic notch on the pulse waveform, in the group of eight patients with a visible dicrotic notch, the CS and LR results differed by only 0.1 (95% CI -0.8-1.1) L min<sup>-1</sup>, the correlation between CS and LR was close to complete ( $r = 0.96$ ;  $p < 0.001$ ), and the percentage error was 40%, with a CCC-CS of 0.98 (95% CI 0.95-0.99).

**Conclusions:** The Capstesia™ smartphone software can provide an alternative method of cardiac output assessment in patients meeting arterial pressure cardiac output evaluation criteria with a clearly discernible dicrotic notch on the arterial pulse pressure waveform. It is necessary to confirm the obtained observations on a larger group of patients; however, it may potentially make objective hemodynamic measurements ubiquitous in patients with invasive arterial pressure monitoring with a clearly discernible dicrotic notch.