A photoplethysmography signal can show presence of a spontaneous pulse at sub-life-supporting blood pressure during experimental cardiopulmonary resuscitation

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**Introduction**

During cardiopulmonary resuscitation (CPR), palpation for arterial pulsations interrupts compressions [1], can be time-consuming [2], and can be challenging to interpret [2]. Long interruptions can result, adversely affecting CPR outcome [3]. Photoplethysmography (PPG, Fig. 1) can show a spontaneous pulse in pigs undergoing automated CPR (Figs. 2, 3 and 4), potentially supporting pulse checks [4, 5]. During compressions, a spontaneous pulse was recognized by an increase in the complexity of the PPG signal (Fig. 4). Here, in data from [4], we determine at which arterial blood pressure (ABP) PPG can show a spontaneous pulse. If this ABP can be sub-life-supporting, presence of a spontaneous PPG-pulse is not a direct indication for return of spontaneous circulation (ROSC).

![Figure 1: Photoplethysmography (PPG) sensors and signal.](image1)

**Methods**

Figure 2 shows the experimental setup.

- Nine pigs underwent automated 30:2 CPR with a compression rate of 100 min\(^{-1}\), after cardiac arrest was induced via an electrical shock.
- Infrared PPG signals were measured on the nose.
- A Millar catheter measured ABP at the aortic arch.
- Mean arterial pressure (MAP) was calculated over 2.4 s (4 complete compressions).

**Results**

Per animal, ABP was described by three parameters in the last 2-min CPR cycle before ROSC detection (Fig. 4):

- **SBP-1** and **DBP-1**: systolic and diastolic blood pressure, respectively, of the first spontaneous pulse in the PPG signal during a ventilation pause.
- **MAP-RNG**: the minimum to maximum range of the MAP during the compressions when the PPG signal showed increased complexity.

![Figure 2: Experimental setup. ABP: arterial blood pressure. PPG: photoplethysmography.](image2)

![Figure 3: Frequency content of PPG and ABP signals over time.](image3)

![Figure 4: Time traces of PPG and ABP signals during 30:2 CPR.](image4)

**Conclusions**

- In our data, PPG shows presence of a spontaneous pulse during CPR, but PPG-pulses can occur at sub-life-supporting blood pressures.

**Disclosures**

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