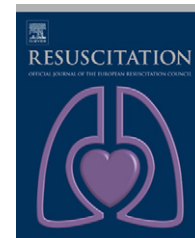




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## CASE REPORT

# Feasibility of correlating the pulse check with focused point-of-care echocardiography during pediatric cardiac arrest: A case series<sup>☆</sup>

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### KEYWORDS

Cardiac arrest;  
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**Summary** Rapidly determining whether an unresponsive child is in cardiac arrest or in shock, and requiring cardiopulmonary resuscitation can be problematic. The pulse check in children has been shown to be unreliable, not only for laypersons, but also for healthcare providers. The recommendation for checking the pulse in unresponsive children has been eliminated for laypersons in the latest edition of the Emergency Cardiovascular Care guidelines. Thus the decision to initiate cardiopulmonary resuscitation in children, with the goal of delivering effective chest compressions, can be fraught with uncertainty. Despite the use of pediatric advanced life support guidelines developed by the American Heart Association and the American Academy of Pediatrics, management and decision making during resuscitation of children in cardiac arrest can be challenging. Outcomes for out-of-hospital pediatric cardiac arrest remain poor. The decision to end resuscitation in children, often an emotionally charged situation, can also be particularly difficult for physicians. Information from focused point-of-care echocardiography that allows for correlation with the presence or absence of a pulse and real time assessment of resuscitation may help direct and optimize the delivery of resuscitative interventions. We report our preliminary clinical observations of using focused point-of-care echocardiography to correlate with the pulse check during resuscitation in a series of pediatric cardiac arrests.

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### Background

Rapidly determining whether an unresponsive child is in cardiac arrest or in shock, and requiring cardiopulmonary resuscitation can be problematic. The pulse check in children has been shown to be unreliable, not only for laypersons, but also for healthcare providers.<sup>1–4</sup> The recommendation for the pulse check for laypersons has been

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eliminated in the recent edition of the Emergency Cardiovascular Care guidelines.<sup>1,5</sup> Thus the decision to initiate cardiopulmonary resuscitation in children, with the goal of delivering effective chest compressions, can be fraught with uncertainty. Similarly, manual or automated blood pressure determination may be difficult to accurately obtain in critically ill children.

Despite the use of pediatric basic and advanced life support guidelines<sup>1,5</sup> developed by the American Heart Association and the American Academy of Pediatrics, management and decision making during resuscitation of children in cardiac arrest can be challenging. Pediatric cardiac arrest is the final common pathway of many diseases and injuries that may afflict children. Outcomes for out-of-hospital pediatric cardiac arrest remain poor, with survival to hospital discharge rates estimated to range from 2 to 12.1%.<sup>6-9</sup> The decision to end resuscitation in children, often an emotionally charged situation, can also be particularly difficult for physicians. Knowledge of prognostic factors that predict poor outcome following cardiac arrest may aid in decision-making. Information that allows real time assessment of resuscitation may help direct and optimize the delivery of resuscitative interventions.

Focused point-of-care echocardiography<sup>10,11</sup> is a non-invasive and simple technique that allows direct visualization of the heart. With direct visualization of the heart: the presence or absence of cardiac activity can be determined and correlated with the pulse check.<sup>11</sup> Additionally, pericardial effusion or cardiac tamponade may be identified<sup>12</sup>; qualitative left ventricular function and response to the administration of fluid, inotropes or vasopressors may be assessed<sup>13-15</sup>; and gross cardiac anatomy may be examined. Cardiac standstill, defined as the complete cessation of myocardial motion, as visualized by initial focused echocar-

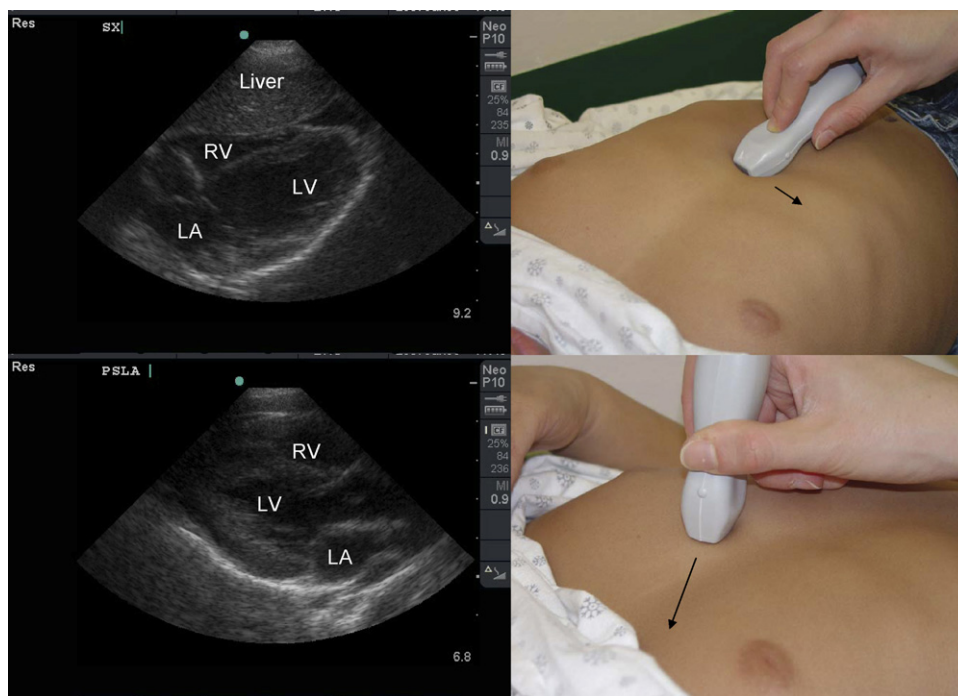
diography during adult cardiac arrest has been shown to be highly predictive of death.<sup>16-18</sup> Whether persistent cardiac standstill on serial focused echocardiography is a predictor for pediatric resuscitations that will ultimately be futile remains to be determined. We report our preliminary clinical observations of using focused point-of-care echocardiography to correlate with the pulse check during resuscitation in a series of pediatric cardiac arrests.

## Objective

To describe clinical observations obtained of using focused point-of-care echocardiography to correlate with the pulse check during resuscitation of children in cardiac arrest and to assess the potential utility of this information in the management of these pediatric patients.

## Methods

Observations were obtained from a non-consecutive case series of focused point-of-care echocardiography performed during resuscitation for pediatric cardiac arrest from the authors' quality assurance ultrasound records. The authors, a pediatric emergency physician and an emergency physician, have extensive experience in the use of point-of-care echocardiography. In these cases, cardiac arrest was defined as the complete cessation of cardiac mechanical contractility, determined by inability to palpate a central pulse, unresponsiveness, and apnea. As part of our clinical practice, data from these cases were recorded according to the Pediatric Utstein style template for uniform reporting of advanced life support data. Clinical observations were recorded immediately after the resuscitation, concu-



**Figure 1** Subxiphoid view of the normal heart and probe position (above). Para-sternal long axis view of the normal heart and probe position (below).

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