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## Letter to the Editor

# Rapid simulator-based training for heart rate assessment in the newborn

Dear Editor,

We read with interest the article from Manzar<sup>1</sup> describing the feasibility of using ultrasound to measure heart rate in newborn infants. Existing methods for heart rate assessment in the delivery room have significant limitations, and ultrasound has been shown to provide more rapid assessment of heart rate than ECG or saturation monitor.<sup>2</sup> We agree with the authors that the growing implementation of point of care ultrasound (POCUS) in the neonatal intensive care unit (NICU) is creating a critical mass of providers with POCUS skills, and assessment of heart rate by ultrasound during cardiac arrest in the NICU or delivery room is supported by recent guidance published by the American Academy of Pediatrics.<sup>3</sup> The availability of handheld ultrasound systems presents an opportunity to widely apply such an approach, with provision of training being a potential limiting factor on implementation.

We assessed the efficacy of a novel simulator-based training package for heart rate assessment in neonatal providers with no prior ultrasound training. Learners watched a 6-minute video presentation before assessing heart rate in a neonatal echocardiography simulator (<https://www.EchoCom.de>). Learners then visualizing the heart of a stable infant in the NICU using a handheld Philips Lumify Linear 12 MHz probe, which was cleaned and positioned inside the isolette for optimal viewing. The transducer was placed over the middle/lower third of the infant's sternum and its position was adjusted until the cardiac chambers were visualized on the center of the screen. During the study, all infants received standard care including continuous monitoring (ECG leads, a pulse oximeter, and a temperature probe) and were maintained on the respiratory support they were on prior to the study. Learners were given up to 2 minutes to practice visualizing the heart. Lastly learners performed a timed heart rate evaluation by counting the number of heart beats in a 6 second window and multiplying by 10. The study was approved by the Institutional Review Board at Mount Sinai Hospital (IRB 18-00613) and signed consent was obtained from all parents of study infants and all neonatal providers.

Training in 24 learners (residents, fellows, attendings, nurse practitioners) was completed in median (IQR) 8.5 (7–10) minutes. All providers successfully quantified heart rate in a stable infant using both brightness (B-mode) and motion (M-mode) ultrasound. The median

difference between heart rate obtained by ECG and both B- and M-modes was <5 beats/minute. M-mode demonstrated less variability in heart rate assessment compared to B-mode. Median times taken to assess heart rate using B and M modes were 8.6 and 13.9 seconds respectively (including 6 seconds for counting of the heart rate).

A rapid, simulator-based training module allows providers without prior scanning experience to rapidly visualize and accurately assess neonatal heart rate using ultrasound. Displaying the heart on a screen during resuscitation may promote a shared mental model for initiation of CPR, potentially facilitating improvements in provision of neonatal life support.

## Ethical approval

The study was approved by the Institutional Review Board at Mount Sinai Hospital (IRB 18-00613). Neonatal providers and parents of eligible study infants were provided with a full explanation of the study and given the opportunity to ask questions. Prior to initiation of the study, signed consent was obtained from all parents of study infants and all neonatal providers.

## Competing interests

The authors have no competing interests to declare.

## Authors' contributions

ESS, SM and AG conceived the study. All authors refined the study protocol. ESS and EP conducted the training and collected outcome data. All authors reviewed the manuscript.

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