

# ***Carotid Doppler ultrasonography for hemodynamic assessment in critically ill children***

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**Objective:** An accurate assessment of cardiovascular performance is essential both to predict and to evaluate hemodynamic response to interventions. The objective of this prospective study was to assess whether point-of-care ultrasonography of the common carotid artery (CCA) is able to estimate the stroke volume (SV) and cardiac index (Ci) of critically ill children.

**Methods:** Participants underwent Doppler ultrasonography of the left CCA and transthoracic echocardiography (TTE). Variables measured by TTE were SV and Ci. Carotid blood flow (CBF) was calculated based on both systolic velocity-time integral (CBF<sub>(s)</sub>) and total velocity-time integral (CBF<sub>(t)</sub>). Carotid corrected flow time was also determined.

**Results:** A total of 50 children were enrolled. Median age and weight of participants were 36.0 months and 14.2 kg, respectively. Both CBF<sub>(s)</sub> and CBF<sub>(t)</sub> correlated very strongly with SV ( $\rho = 0.98$  and  $0.97$ , respectively) and Ci ( $\rho = 0.96$  and  $0.92$ , respectively). Agreement analysis showed low biases and clinically acceptable percentage errors between variables measured by TTE (SV and Ci) and those estimated by Doppler ultrasonography. Linear regression analysis revealed that the Ci of mechanically ventilated children can be estimated by the following equation:  $Ci = 0.703 + 6,479 \times CBF(s) \times \text{heart rate} / \text{body surface area}$ . Carotid corrected flow time did not significantly correlate with SV or Ci ( $\rho = 0.27$  and  $0.05$ , respectively).

**Conclusion:** Doppler ultrasonography of the left CCA is able to estimate the SV and Ci of critically ill children. Therefore, the CDU may be considered as an alternative for estimating Ci in critically ill children when TTE is not feasible or available.