Arterial pulse wave analysis: An accurate means of determining cardiac output in children

Objective: Cardiac output is a useful measure of myocardial performance. Standard methods of determining cardiac output are not without risk and can be problematic in children. Arterial pulse wave analysis (PulseCO), a novel, minimally invasive cardiac output determination technique, offers the advantage of continuous monitoring, convenience, and low risk. This technique has not been validated in children. The purpose of this study was to validate PulseCO as an accurate means of noninvasively determining real-time cardiac output in children.

Design: Prospective, single-center evaluation.

Setting: Children's hospital.

Patients: Any child with a structurally normal heart, undergoing hemodynamic evaluation in the cardiac catheterization laboratory, was included.

Interventions: A prograde right heart catheterization was performed, and cardiac output was determined using the thermodilution technique, via placement of a pulmonary arterial catheter.

Measurements and main results: Thermodilution results were compared with continuous real-time cardiac output measurements obtained with the PulseCO system, and they were then analyzed by standard correlation techniques and Bland-Altman analysis. Twenty patients were evaluated with a median age of 10.5 yrs and a median weight of 25 kg. The mean thermodilution cardiac index was 3.3 +/- 0.9 L/min/m, whereas the mean PulseCO cardiac index was 3.1 +/- 0.9 L/min/m. Standard Pearson correlation tests revealed a correlation coefficient of .94 (p < .001). Bland-Altman analysis revealed excellent clinical agreement with a mean difference of 0.19 L/min/m and a precision of 0.28 L/min/m at 2 sd.

Conclusions: Arterial pulse wave analysis by the PulseCO system provides a novel, minimally invasive method of determining real-time cardiac output in children.