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Pulse Oximetry in Transport of Poorly-Perfused Babies

Goldstein MR, Liberman RL, Taschuk RD, Thomas A, and Vogt JF. *Pediatrics* 1998;102(3):818

Introduction

Poor perfusion and monitoring site motion can adversely affect pulse oximetry readings. This short coming worsens during patient transport in that the motion component is both innate and imposed. The degree of monitoring error can be so great as to render the output meaningless on the most acutely ill (a zero, dashed lines or a spurious % SpO₂ value is displayed). The paradox of conventional pulse oximetry has been that in those patients where continuous monitoring of oxygenation status would be most beneficial, their condition (physiology and environmental) can foil the measurement. Persistent Pulmonary Hypertension of the Newborn (PPHN) is a condition where venous blood mixes with systemic. If the peripheral pulsations are great enough and not confounded by artifact, the shunt can be detected by differential pulse oximetry (right arm versus any other extremity). Masimo has developed a unique sensor design and software algorithms designed to identify the % SpO₂ and pulse rate regardless of patient or environmental challenges. In particular, helicopter transport of acutely ill subjects has been associated with reports of pulse oximeter failures with various models from multiple manufacturers of conventional pulse oximeters.

Methods

Five infants, all with documented cardiac shunting due to PPHN and transported via helicopter, comprised the study population. All infants were acutely ill and referred for extracorporeal membrane oxygenation (ECMO) or inhaled nitric oxide (INO) therapy. The results of motion and low peripheral perfusion (variable cardiac shunt) on the reliability of two pulse oximeters (a conventional-type, the Nellcor N-200, and a new Masimo-based unit) were evaluated.

Results

The pulse oximeters were functional on every infant prior to transport. However, both imposed motion and low perfusion were responsible for failures to read by the pulse oximeters. % SpO₂ readings were evaluated in terms of failure rate (number of failures/number of total data points). Failures were defined as a pulse oximeter display of zero or any SpO₂ value where the oximeter pulse rate and ECG heart rate were not within 5 beats/minute. A large and significant difference in failure rate was found between the two manufacturers.

	 Masimo SET	Nellcor N-200
Failure Rate due to Helicopter Takeoffs/Landings	0%	100%
Failure Rate due to Low Perfusion	5%	74%

Authors' Discussion and Conclusions

“Access to the continuous output of post-ductal oximetry was extremely valuable to the clinical management of PPHN during transport. **Pulse oximetry with Masimo SET has dramatically fewer failures than conventional pulse oximetry during interhospital transport of poorly perfused infants.**”