

Peripheral tissue oxygenation measurement by NIRS (near-infrared spectroscopy) using the Nonin/Equanox-7600 is not disturbed in helicopter-EMS (HEMS) environment.

P. Schober, H.M.T. Christiaans, S.A. Loer, L.A. Schwarte*

Department of Anaesthesiology, VU university medical center (VUmc), Amsterdam, NL
Trauma Center North/West Netherlands, Amsterdam, NL

Background & Goal of Study: Preservation of adequate peripheral tissue oxygenation remains crucial in treatment of critical patients. Traditional monitoring methods address systemic oxygenation, frequently not allowing conclusions on tissue oxygenation (1). In addition, in HEMS-settings traditional monitoring may become disturbed by helicopter-inherent factors, e.g., cabin vibrations. The portable Nonin/Equanox-7600 NIRS-monitor appears attractive to measure peripheral tissue oxygenation in EMS, given the size, durability and suggestion that Equanox-technology is specifically artifact-resistant. To our knowledge, no data are available on the impact of a helicopter environment (e.g., vibrations) on NIRS-measurement of peripheral oxygenation (2,3).

Materials & Methods: The study was conducted at a level-1 university trauma-center (VUmc, Amsterdam, The Netherlands). To limit fluctuations in tissue oxygenation, the study was performed on healthy volunteers (n=6 measurements; informed consent), positioned in the HEMS-helicopter patient cabin (EuroCopter; EC-135). NIRS was measured by a Nonin/Equanox-7600 monitor with 8000CA-probes placed on the forearm/thenar of the dominant arm. Protocol: After sufficient equilibration ("BASELINE"), helicopter engines were started subsequently ("ENGINES") and kept running for several minutes. After engine shut-down, subsequent "POST"-data were collected.

Results & Discussion: Inter-individual differences in "BASELINE" (rSO₂-range ~75%-85%) were noted based on sensor location, however intra-individual NIRS-measurements by Nonin/Equanox-7600 were not systematically affected by helicopter artifacts, e.g., cabin vibrations ("ENGINES"). In addition, no helicopter-instruments were apparently disturbed by the Nonin/Equanox-7600-monitor.



Fig.1: Mounted NIRS monitor in the patient cabin.



Fig. 2A/B: Study setting with NIRS probe at the forearm.

Conclusions: Our findings suggest that NIRS-measurements by Nonin/Equanox-7600 are not disturbed by HEMS-typical confounders, e.g., engines start-up/shut-down and helicopter vibrations. Therefore, the Equanox-technology based NIRS-system could become a valuable addition in HEMS-settings. Further studies will have to define how NIRS-monitoring may support (HEMS-) therapy and ultimately (HEMS-) outcome.

References:

- (1) Schwarte, et al.; Br. J. Anaesth. 2010
- (2) Burillo-Putze, et al.; Air. Med. J. 2002
- (3) Schwarte, et al.; Eur. J. Anaesth. 2008

