

Cerebral Oximetry Determination of Desaturation with Norepinephrine Administration May Be Device Manufacturer Specific

To the Editor:

The recent cerebral oximetry study by Sørensen *et al.*¹ outlining the impact of cutaneous blood flow on near-infrared spectroscopy derived measurements of cerebral saturation highlights a potentially important confounder in the interpretation of information provided by most currently available cerebral oximetry monitors. Although cerebral oximetry is intended to provide information on the blood oxygen saturation of the brain, it has inherent limitations related to the variable contamination from the extracranial tissues² that, to date, have been incompletely addressed. Whereas Sørensen *et al.*¹ report an elegantly conducted and interpreted clinical investigation, we believe that they have not adequately highlighted the manufacturer-specific impact of norepinephrine-induced extracranial vasoconstriction on the accuracy of near-infrared spectroscopy. It is likely that their findings are more specific to the INVOS (Covidien; Mansfield, MA) monitor that they used and should not be generalized to all devices.

We have previously reported that when compared to several other devices that are commercially available, the specific oximeter they used appears particularly prone to extracranial (*i.e.*, cutaneous) contamination. As a result, the norepinephrine administration results in falsely lowering the cerebral saturation as a result of reduction in blood flow to the extracranial tissues. Although they correctly identify this mechanism, it is much less likely to happen with some of the other devices that are also widely available. Thus, the generalizability of this finding to all oximeters implied by this study is somewhat questionable and should wait until similar types of investigations are undertaken with these other devices. In particular, the title of the paper and accompanying abstract, which in this day and age of online search strategies are arguably the most frequently searched aspects in published literature, would prevent the casual reader from appreciating this potentially important limitation.

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affects near-infrared spectroscopy determined cerebral oxygen saturation during administration of norepinephrine. *ANESTHESIOLOGY* 2012; 117:263–70

2. Davie SN, Grocott HP: Impact of extracranial contamination on regional cerebral oxygen saturation: A comparison of three cerebral oximetry technologies. *ANESTHESIOLOGY* 2012; 116:834–40

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In Reply:

We thank Grocott and Davie¹ for their interest in spatially resolved near-infrared spectroscopy (SR-NIRS) evaluation of cerebral oxygenation and for their unique evaluation of skin influence on three commercially available SR-NIRS systems. We acknowledge that our findings may not apply to all SR-NIRS systems, and although unintended, the title of the article may be too general. Throughout the discussion and the conclusion, however, we meticulously specify that it is the INVOS machine that is evaluated.² At the same time, we understand that Grocott and Davie¹ suggest that cutaneous oxygenation affects evaluation not only by INVOS but also by Foresight and EQUANOX. We find it likely that vasoconstriction observed during administration of noradrenaline exerts a similar impact on the SR-NIRS-determined frontal lobe oxygenation as scalp ischemia.¹ Cerebral blood flow or oxygenation was not measured in that study, but we find it unlikely that headband occlusion of skin blood flow influences cerebral variables and the reduction in SR-NIRS evaluation of cerebral oxygenation is, therefore, most likely explained by a flawed SR-NIRS methodology. Taken together, the evidence obtained by different experimental approaches^{1,2} suggests that not only the INVOS SR-NIRS is affected by cutaneous contamination of the signal. In fact, on-going evaluation suggests that INVOS SR-NIRS is less affected by skin oxygenation than other systems, although we, obviously, have not evaluated the influence of skin oxygenation on all SR-NIRS apparatus.

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