

Corresponding Author

Stephanie Harper
North West School of Anaesthetics
3 Piccadilly Place
Manchester
UK

Cerebral oximetry in adult cardiac surgery: a closer look at outcomes.

Stephanie Harper¹, Danielle Eusuf², Jan Hansel³, Clifford Shelton^{4,5}

¹Senior Clinical Fellow, Department of Anaesthesia, Wythenshawe Hospital, Manchester University NHS Foundation Trust, Manchester, UK

²Specialty Trainee, North West School of Anaesthetics, Manchester, UK

³NIHR Academic Clinical Fellow, North West School of Intensive Care Medicine, Manchester, UK

⁴Consultant, Department of Anaesthesia, Wythenshawe Hospital, Manchester University NHS Foundation Trust, Manchester, UK

⁵Senior Clinical Lecturer in Anaesthesia, Lancaster Medical School, Faculty of Health and Medicine, Lancaster University, Lancaster, UK

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Editor –

We discussed Bennett et al.'s randomised controlled trial on the use of cerebral oximetry to reduce the incidence of neurological impairment at our regional journal club, based in the North West School of Anaesthesia.¹ This study found a reduced duration of stay in intensive care and improved self-reported functional status at six months amongst 90 patients who received cerebral oximetry monitoring and protocolised interventions to maintain cerebral oxygen saturation above baseline, compared to 91 patients who received a 'sham' intervention (monitoring attached but not connected) for blinding purposes. Although these outcomes are potentially important and suggest that the routine use of cerebral oximetry may have a role in cardiac surgery, we feel that the study may have been ill equipped to detect other important findings.

Bennett et al. specified five primary outcomes, comprising early neurocognitive dysfunction, neurological dysfunction such as stroke and delirium, self-reported functional status at six months, cognition at six months, and hospital length of stay. However, their study was only powered to detect early neurocognitive dysfunction. In their power calculation, the authors assumed a 50% reduction in the incidence of early neurocognitive dysfunction, and used a similar study by Slater et al. to predict a baseline incidence of 40%.² However, we note that although Slater et al. randomised 265 patients to intervention (cerebral oximetry with measures taken to treat desaturation) or control (cerebral oximetry recorded but not displayed), they found no statistically significant difference in early neurocognitive dysfunction between groups.² This prior finding suggests that Bennett et al.'s power calculations were based on a magnitude of clinical benefit that they were highly unlikely to observe.¹ Furthermore, we suggest that a much less ambitious improvement would have nevertheless met the criteria of the 'minimal clinically important difference'.^{3,4}

A significant difference in self-reported functional ability at six months was found by Bennett et al., favouring the intervention group.¹ Although several validated measures incorporating functional status exist,⁵⁻⁷ their study used what appears to be a newly created scale which involved asking patients to state how they were managing stairs, driving, cleaning, dressing, and cooking better, in comparison to pre-operatively (i.e., better, the same or worse).^{1,4} Whilst this scale does have face validity for the assessment of activities of daily living, it is notable that some of these activities (e.g., driving) may not be done by all, thereby limiting the options available to some patients. It is unclear how this scale handles these potential issues, and the authors do not explain the design or justify the use of this questionnaire in their study design, or comment on its reliability or validity.^{1,4}

The full potential of cerebral oximetry in cardiac surgery remains to be fully determined. Whilst there are sound theoretical foundations for its use, the potential benefits have not yet been shown to translate into practice. Whilst Bennett et al. have identified some encouraging results, we feel that the generalisability of some of their findings may have been hampered somewhat by decisions made in the study design. To set their findings in context, we would be interested to learn more from Bennett et al. about the development of their follow-up scale, the selection of their primary outcomes, and how they arrived at the threshold of 50% improvement when powering their study.

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