Reviewer’s report

Title: Evaluation of two SpO2 alarm strategies during automated FiO2 control in the NICU: a randomized crossover study

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Reviewer: Wissam Shalish

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The following manuscript evaluated, in a randomized crossover fashion, the impact of two SpO2 alarm strategies during automated FiO2 control on frequencies of alarms as well as SpO2 extremes. The study overall provides interesting and novel findings regarding the consequences of setting a tight or loose alarm strategy, and setting a broad or relatively narrower alarm delay, when using automated FiO2 control systems. However, a few suggestions and important clarifications are needed:

Overall comments

- A more in depth review of the evidence regarding alarm fatigue may strengthen the rationale for this study: What constitutes alarm fatigue (i.e. what is the threshold for which alarm fatigue may pose a problem, based on the available evidence)? Are there data reporting frequency of alarms and/or perceptions of alarm fatigue in patients exposed to automated FiO2 control as opposed to manual control? In other words, does a median alarm frequency of 5 per hour, as shown in the tight SpO2 target strategy, correlate with alarm fatigue based on the available literature?

- A similar review on SpO2 alarm delay is needed: what is currently reported in the literature? On what basis were alarm delays of 30-sec and 90-sec selected?

- In the introduction, the authors rightfully indicate that the aim of this study was to determine whether a loose alarm strategy could significantly reduce alarm frequency "without increasing over reliance on automation". The fact that the loose alarm strategy did not create an increased exposure to SpO2 extremes is reassuring. However, it is also very important to look at the automated fluctuations in FiO2 for each patient as a marker of safety. The results section seems to indicate a wide IQR for FiO2 changes, but it is not clear how much oscillation occurred per patient? This is critical, because in the first days of life, small FiO2 changes may indicate changes in lung state that could require more prompt intervention (Example: lung derecruitment from improper ETT placement, pneumothorax, pulmonary hemorrhage, need for surfactant etc). Thus, it may be warranted that the clinical team be
notified (using alarms) of wide fluctuations in FiO2 even in the absence of SpO2 extremes. Further elaboration on this notion could strengthen the manuscript, as follows:

- Provide histograms of FiO2 variability (similar to Figures 1a and 1b), but making sure to separate the tight and loose strategies for comparison sake.

- Provide more data, if possible, on the patient population: did they all receive surfactant? What was the mode of ventilation (volume-targeted ventilation requires less accrued monitoring as it auto-adjusts to patient's lung compliance), were blood gases any different during the tight or loose alarm strategies?

- Discuss above findings in the Discussion section

Other minor clarifications

- What was the averaging time for SpO2?

- Based on Table 3, it appears that there is some overlap in the high and low SpO2 alarms between the 2 groups. This might be better shown in the form of histograms comparing the distributions of high SpO2 alarms (tight vs. loose strategy) and low SpO2 alarms (tight vs. loose strategy). This could be provided in the supplementary appendix. If the overlap appears important, then could one speculate that the observed results stem more from the 90-second delay rather than the alarm strategy itself?

- In Table 3, should FiO2 be shown as median (IQR) or mean (SD)? It is not clear based on the fact that it says 'median' but only one value is presented between parentheses.

- There are several minor typos and syntactical errors throughout the manuscript. Careful revision is required.

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

Yes

Does the work include the necessary controls?
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Yes
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