Author’s response to reviews

Title: New generation continuous cardiac output monitoring from carbon dioxide elimination

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Author’s response to reviews:

Dr. John Doyle
Editor, BMC Anesthesiology

Dear Dr. Doyle,

Thank you for the opportunity to submit a revised version of this manuscript to BMC Anesthesiology. We thank the Reviewers for their interest in this work and their helpful comments. We have made some significant additions to the manuscript in response to their comments, as well as corrected a few small typographical mistakes. The changes are marked in red type.

In particular, we have reformatted the abstract and are resubmitting as a Review, as suggested by both Reviewers. We formulated this manuscript in response to your Call for Papers on the theme of anesthesia technology and clinical equipment evaluation. We agree entirely that the manuscript is a review of previous publications, and are very happy to have it evaluated on this basis if that best meets journal policy.
We believe the changes made have improved the manuscript a great deal, but have also lengthened it somewhat. We hope this remains satisfactory to the journal, and look forward to your decision.

Reviewer 1.

1. Because this is a narrative review, suggest revising the format of the abstract according the journal style as (1) background (2) main text, and (3) conclusions.

Response: This has been done. Thank you for your interest in this work.

Reviewer 2.

1. The abstract format does not fit with the structure of the manuscript. The "methods" describe what was done in previous research work rather than what was done in this work. Perhaps, a better approach is a different abstract format (if allowed by the editors) or a description of the specific review question asked and how the literature reviewed was chosen (a systematic review). Personally, I prefer the first approach rather the second approach for this manuscript.

Response: In line with the comments made by Reviewer 1, we agree that this manuscript best meets the definition of a Narrative Review, and have revised the Abstract on that basis.

2. Are there patient populations or surgical procedures where this type of monitoring may be inaccurate or should be used with caution? For example, are these monitoring techniques accurate in pulmonary embolism or severe COPD, conditions effecting dead space ventilation. I understand that this data may not, yet, exist; however, a discussion of hypothetical effect could be helpful to the reader in understanding the potential limitations to this type of monitoring.
Response: Thank you for raising this point. Not devoting some space to outlining the limitations of the method was an oversight by us, and we have now added a section listing the main limitations as we see them, and deal with concerns about lung disease here. We hope that this has not lengthened the paper excessively.

3. Likewise, are hypodynamic conditions and hyperdynamic conditions accurate to the same conditions? As I understand the physiologic consequences of hypodynamic conditions and severe hypovolemia, there are increases in dead space ventilation that may interfere with either Capnotracking or Capnodynamic monitoring?

Response: We have added a comment about error expected from pulmonary alveolar deadspace to P12. However, the linearity of the method achieved in both animal and human studies makes it clear that this consideration is not a significant practical flaw.

4. Volume responsiveness is a fundamental clinical target and is described in the introduction; however, there is no clear description of the use or effectiveness of either Capnotracking or Capnodynamics for predicting volume responsiveness. This may be particularly difficult given the way that volume responsiveness is measured and the way that carbon dioxide is measured. Please include description or discussion of the possibility or limitations to measuring this clinical target.

Response: The reviewer is correct that clinical studies formally assessing volume responsiveness with the method, or comparing it to other methods, are still to be done. We have added a further paragraph to the “Future directions” section pointing this out and have added that comparison and combination of measurements from other methods may have useful benefits in terms of improved reliability and precision. We have added an additional reference to this effect.

5. What are the next steps and the major hurdles that need to be overcome by researchers prior to widespread adoption of these techniques? This could be important to add to the conclusion/discussions.
Response: The paragraph we have added to the “Future directions” section touches on the potential application of the method for large effectiveness trials, which are needed to confirm the benefits of goal-directed haemodynamic management on patient outcomes, before widespread adoption.

6. The figures appear to be reproductions of previously published figures. Rights to these figures should be secured by the authors.

Response: This will be attended to as soon as we have the manuscript accepted. The Figures used are from our own published papers and the necessary approvals will therefore be readily forthcoming.

Yours sincerely,

Philip Peyton