Reviewer’s report

Title: Implementing Blended Learning in Emergency Airway Management Training: A Randomized Controlled Trial

Version: 0 Date: 18 Oct 2017

Reviewer: Elliot Long

Reviewer’s report:

Thank-you for the opportunity to review the manuscript titled "Implementing Blended Learning in Emergency Airway Management Training: A Randomized Controlled Trial". The authors describe the development of online-learning materials, and then randomize participants to either online learning or more conventional lecture-based learning, and then combine the groups for simulation-based skills training. Participants were administered pre- and post-course theory and practical assessment. The hypothesis was that online-learning was non-inferior to lecture-based learning. The results of the study were that scores for both the online-learning cohort and lecture-based learning cohort improved to a similar degree after the course. The authors conclude that online-learning is as effective as lecture-based learning, and may be a feasible alternative.

The topic of the study is important, as resource and time limitations may be prohibitive for both airway course faculty and participants, and emergency airway management is a high risk, low frequency procedure. The authors are to be commended for undertaking the task of trying to clarify how best to teach specialized knowledge and skills to large groups of participants.

Overall the study was well conducted and reported. I found the results section detailing participant response to questionnaires to be overly long, and would have difficulty reproducing this study in another setting based on the methodology reported. Detailed review of each section is provided below.

The abstract was concise, well presented, and addressed the primary and secondary outcomes well.

Background: The background gives a nice description of "blended learning" theory. Alternative forms of learning (eg- "flipped" or "inverted" classroom) should be mentioned and rationale for the choice of online learning given. The primary and secondary outcomes are well described.

Methods: It was not clear what the overall aims of emergency airway management training were (theory, skills, or human factors or all of the above), how these were derived (from local safety gaps identified, from the literature (eg- NAP4), from the content of other courses (as mentioned), or from college learning requirements (or other)), which of these learning aims were best suited for online learning and why (eg- skills and human factors training may not be suitable for blended learning, but theory might), and which were best suited to other forms of learning and
why. More detail about the module topics and skills stations would be helpful (and whether module topics were the same for both the online learning and lecture-based learning groups). More detail on the video's, quizzes, and forum topics for the online learning group would also be helpful, perhaps as supplemental material. The derivation of the outcome measures (theory and practical assessment) and more detail on their content would be helpful. The participants were combined for the "one-day hands on session", were there any measures undertaken to prevent confounding (eg- separating groups into BL and F2FL)? Were the assessors blinded to participant study arm?

Results: The results section would benefit from significant shortening. Many of the results could be summarized, tabulated, or presented as supplementary (online) material only. Table 2 could be omitted.

Discussion: It is unclear what content was delivered by online learning, this would be worth clarifying in the methods and adding to the discussion. The theoretical discussion (lines 361-377) could be omitted or related directly to the outcome measures. Limitations should include the internal validity only of study interventions, the potential for confounding by combining participants for the "one-day hands on session", the potential for bias if assessors were not blinded, and the fact that no patient-centered outcomes were targeted.

Conclusion: without more detail on the content of online learning, it is difficult to say whether skill-based training delivered by online learning is equivalent to that delivered by lecture. The conclusion should relate only to equivalence or non-inferiority of learning modules that differed between participant groups (as the one-day hands on session was combined; ie- were skills taught by online learning??).

Thank-you again for the opportunity to review this manuscript.

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

Unable to assess

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

Yes

**Are the conclusions drawn adequately supported by the data shown?**
If not, please explain in your comments to the authors.

Yes
Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review? If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I am able to assess the statistics.

Quality of written English
Please indicate the quality of language in the manuscript:

Needs some language corrections before being published.

Declaration of competing interests
Please complete a declaration of competing interests, considering the following questions:

1. Have you in the past five years received reimbursements, fees, funding, or salary from an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?

2. Do you hold any stocks or shares in an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?

3. Do you hold or are you currently applying for any patents relating to the content of the manuscript?

4. Have you received reimbursements, fees, funding, or salary from an organization that holds or has applied for patents relating to the content of the manuscript?

5. Do you have any other financial competing interests?

6. Do you have any non-financial competing interests in relation to this paper?

If you can answer no to all of the above, write 'I declare that I have no competing interests' below. If your reply is yes to any, please give details below.

I declare that I have no competing interests.

I agree to the open peer review policy of the journal. I understand that my name will be included on my report to the authors and, if the manuscript is accepted for publication, my named report including any attachments I upload will be posted on the website along with the authors' responses. I agree for my report to be made available under an Open Access Creative Commons CC-BY license (http://creativecommons.org/licenses/by/4.0/). I understand that any comments which I do not wish to be included in my named report can be included as confidential comments to the editors, which will not be published.

I agree to the open peer review policy of the journal.