

## **Virtual reality simulation for critical pediatric airway management training**

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VIRTUAL REALITY SIMULATION FOR CRITICAL PEDIATRIC AIRWAY  
MANAGEMENT TRAINING

Journal of Clinical and Translational Research

Dear Dr Putnam,

Reviewers have now commented on your paper. You will see that they are advising that you revise your manuscript. If you are prepared to undertake the work required, I would be pleased to reconsider my decision.

For your guidance, reviewers' comments are appended below.

If you decide to revise the work, please submit a list of changes or a rebuttal against each point which is being raised when you submit the revised manuscript. Also, please ensure that the track changes function is switched on when implementing the revisions. This enables the reviewers to rapidly verify all changes made.

Your revision is due by Oct 28, 2020.

To submit a revision, go to <https://www.editorialmanager.com/jctres/> and log in as an Author. You will see a menu item call Submission Needing Revision. You will find your submission record there.

Yours sincerely

Michal Heger  
Editor-in-Chief  
Journal of Clinical and Translational Research

Reviewers' comments:

Reviewer #2: Thank you for this opportunity to review the manuscript, "Virtual Reality Simulation for Critical Pediatric Airway Management Training." The authors clearly invested a lot of time and energy into this project and I commend them for their effort. Regarding the discussion and conclusion, I have several concerns. In the discussion section, the authors discuss how the instructional videos and VR trainer were "extremely well received." This does not appear to support the results as seen in Table 3 where a significant portion of the study participants are rating perceptions of VR trainer as neutral, disagree or strongly disagree. This points to the larger issue surrounding the potential impact of this innovative educational tool and how this study's conclusions on adding VR to instructional videos could enrich education. A general survey of perceptions and very limited pre/post test on knowledge where only a few questions (particularly the 3 knowledge gaps related to Heimlich maneuver, Mcgills forceps, and anaphylaxis) showed significant differences, is not enough to assess the impact of the intervention and at best concludes the need for further research. For instance, how would instructional videos combined with the traditional interactive videos on a desktop computer compare to instructional videos combined with VR trainer?

Specific Comments by section:

Introduction:

The authors claim that this is a unique study with respect to VR trainer and pediatric airway management. Please see "An Evaluation of a Virtual Reality Airway Simulator" PMID: 12088944

Materials and Methods

In case others wish to reproduce this study, or a similar study, additional details about the instructional videos would be helpful to include. What was the duration of these videos? Were the answers and concepts discussed in the videos, the same as the questions asked in the preop/postop questions? With respect to the VR trainer, it is unclear to the reviewer how decisions were made and managed. For example, with a foreign body aspiration, did the trainer allow decisions on IV induction versus inhalational induction? If this is a novel way of teaching, the reader will likely be interested in how this trainer provides unique experiences for teaching and examples would be helpful.

Results:

"This suggests that a combination of videos and the VR trainer with or without didactic lectures were the preferred method of instruction for the understanding and management of pediatric critical airway events." - Please consider moving this previous comment to the discussion section.

## Discussion

The discussion, "most participants showed small to significant improvements in their understanding of pediatric anatomy and emergency airway management" - true that this could reflect experience but it may be more suited to discuss these findings with respect to identifying knowledge gaps of specific areas such as Heimlich maneuver, McGill forcep use and anaphylaxis physical exam findings. Perhaps the pre/post test questions is a method of better understanding the study populations knowledge gaps, rather than or in addition to a pure education tool given the relatively small improvement noted in answers to pre/post test questions and limitations of using T/F questions to assess improvement of knowledge.

How did the authors decide on using these specific questions for the tests? Were these based on questions known to be knowledge gaps in critical pediatric airway management? Also, True false questions versus multiple choice? There are limitations to knowledge assessments based on using T/F question formatting see: Brassil, C.E., Couch, B.A. Multiple-true-false questions reveal more thoroughly the complexity of student thinking than multiple-choice questions: a Bayesian item response model comparison. *IJ STEM Ed* 6, 16 (2019).  
<https://doi.org/10.1186/s40594-019-0169-0>

## Conclusions:

Not necessarily the first, see above citation PMID

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## Authors' response

### JCTR Revision #1 Comments

The authors thank the reviewer for their helpful and constructive comments.

### Reviewer #2:

1. *In the discussion section, the authors discuss how the instructional videos and VR trainer were "extremely well received." This does not appear to support the results as seen in Table 3 where a significant portion of the study participants are rating perceptions of VR trainer as neutral, disagree or strongly disagree. Language updated to reflect that the Instructional Videos were better received than VR, Discussion: Para 1.*
2. *This points to the larger issue surrounding the potential impact of this innovative educational tool and how this study's conclusions on adding VR to instructional videos could enrich education. A general survey of perceptions and very limited pre/post test on knowledge where only a few questions (particularly the 3 knowledge gaps related to Heimlich maneuver, Mcgills forceps, and anaphylaxis) showed significant differences, is not enough to assess the impact of the intervention and **at best concludes the need for further research. Acknowledged – the limitation of the pre/post quiz added to limitations (Discussion: Para 3) and "improvement in knowledge" qualified in Para 2 of the Discussion. For instance, how would instructional videos combined with the traditional interactive videos on a desktop computer compare to instructional videos combined with VR trainer? We have not explored this specific suggestion. Our study did not include a natural control or***

alternative approach group.

**3. Introduction**

*The authors claim that this is a unique study with respect to VR trainer and pediatric airway management. Please see "An Evaluation of a Virtual Reality Airway Simulator" PMID: 12088944 – Addressed in Introduction: Para 3.*

**4. Materials and Methods**

*In case others wish to reproduce this study, or a similar study, additional details about the instructional videos would be helpful to include. Given that much of the development of the video and VR programs are proprietary we were limited somewhat in the detail that we were reasonably able to provide. We believe however, that our description of the software used and the manner in which the videos were put together should be sufficient given these limitations.*

5. *What was the duration of these videos? 45 minutes for the instructional videos, added to Methods: Product development section 2.1*

6. *Were the answers and concepts discussed in the videos, the same as the questions asked in the preop/postop questions? Yes. Addressed in Methods: Product evaluation section 2.4*

7. *With respect to the VR trainer, it is unclear to the reviewer how decisions were made and managed. For example, with a foreign body aspiration, did the trainer allow decisions on IV induction versus inhalational induction? If this is a novel way of teaching, the reader will likely be interested in how this trainer provides unique experiences for teaching and examples would be helpful. Added in new paragraph to Methods: VR program section 2.2*

8. **Results:** *"This suggests that a combination of videos and the VR trainer with or without didactic lectures were the preferred method of instruction for the understanding and management of pediatric critical airway events." - Please consider moving this previous comment to the discussion section. Moved to Discussion: Para 1.*

9. **Discussion:** *The discussion, "most participants showed small to significant improvements in their understanding of pediatric anatomy and emergency airway management" - true that this could reflect experience but it may be more suited to discuss these findings with respect to identifying knowledge gaps of specific areas*

*such as Heimlich maneuver, McGill forcep use and anaphylaxis physical exam findings. Added this comment to the Discussion: Para 2.*

10. *Perhaps the pre/post test questions is a method of better understanding the study populations knowledge gaps, rather than or in addition to a pure education tool given the relatively small improvement noted in answers to pre/post test questions and limitations of using T/F questions to assess improvement of knowledge. Added comment in the limitations paragraph of the Discussion: Para 3*
11. *How did the authors decide on using these specific questions for the tests? Were these based on questions known to be knowledge gaps in critical pediatric airway management? Also, True false questions versus multiple choice? There are limitations to knowledge assessments based on using T/F question formatting see: Brassil, C.E., Couch, B.A. Multiple-true-false questions reveal more thoroughly the complexity of student thinking than multiple-choice questions: a Bayesian item response model comparison. IJ STEM Ed 6, 16 (2019). <https://doi.org/10.1186/s40594-019-0169-0> Added comment in section 2.4 of methods. And comment in limitations, Discussion: Para 3.*

**Conclusions:** *Not necessarily the first, see above citation PMID. We have been unable to find a study using immersive VR scenarios for training in the management of Pediatric Airway Emergencies. The article referenced refers to a specific skill-trainer, using VR simulation to teach bro*

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2<sup>nd</sup> Editorial decision  
07-Nov-2020

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VIRTUAL REALITY SIMULATION FOR CRITICAL PEDIATRIC AIRWAY  
MANAGEMENT TRAINING  
Journal of Clinical and Translational Research

Dear authors,

I am pleased to inform you that your manuscript has been accepted for publication in the Journal of Clinical and Translational Research.

You will receive the proofs of your article shortly, which we kindly ask you to thoroughly review for any errors.

Thank you for submitting your work to JCTR.

Kindest regards,

Michal Heger  
Editor-in-Chief

Journal of Clinical and Translational Research  
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Comments from the editors and reviewers: