Author’s response to reviews

Title: TEACHING THE PEDIATRIC EAR EXAM AND DIAGNOSIS OF ACUTE OTITIS MEDIA: A TEACHING AND ASSESSMENT MODEL IN THREE GROUPS

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Author’s response to reviews:

Dear Dr. Azer,

We thank Dr. Krishnapillai and you for the excellent comments provided regarding the initial submission of our manuscript entitled “Teaching the Pediatric Ear Exam and Diagnosis of Acute Otitis Media: A Teaching and Assessment Model”. We have revised the manuscript according to the recommendations of the reviewers and feel that the changes made have significantly improved the overall quality of the manuscript. Below is our point-by-point response to each individual comment of the reviewers.

Sincerely,

Caroline Paul, M.D.
Comments of Reviewer 1

1. However, the title should be modified as below: Teaching the pediatric ear exam and diagnosis of acute otitis media: A teaching and assessment model in 3 groups.

Author Response: We agree with the change in the title of the manuscript suggested by the reviewer.

Author Action: We have changed the title of the revised manuscript to the following: “Teaching the Pediatric Ear Exam and Diagnosis of Acute Otitis Media: A Teaching and Assessment Model in Three Groups.”

2. Under results: on page 9, first line, For the written test, pre-intervention scores were similar (p=0.78) and not p=0.48 as mentioned.

Author Response: We thank the reviewer for noticing this mistake.

Author Action: We have added the correct p-value of 0.78 in the Results Section of the revised manuscript.

3. Please format all references as required by the journal.

Author Response: We thank the reviewer for noticing this mistake.

Author Action: We have used the BMC Medical Education standard format in EndNote to make sure that all the references in the revised manuscript are in accordance to the style of the journal.
Comments of Reviewer 2

1. Abstract: What are the research questions?

Author Response: We agree with the reviewer that the Abstract should contain the research question of our study.

Author Action: We have added the following sentence at the end of the Background Section of the Abstract of the revised manuscript: “The objective was to determine whether students who received the intervention would demonstrate significant gains in pediatric otoscopy skills when compared with students with only routine immersion learning exposure.”

2. Abstract: There is a lack of connection between the aims of the study, and the needed research questions and what was mentioned under methods. What are the authors trying to test? What is the educational basis for their research method?

Author Response: We agree with the reviewer that the Abstract should have a better connection between the aims of the study, the research question, and the methods used in the study.

Author Action: We expanded the Background Section of the Abstract to emphasize the need for improved diagnosis of acute otitis media through development of proficient otoscopy skills, the lack of current educational curricula to meet the clinical and educational needs, and our research question of whether a formal curriculum intervention could demonstrate gains in pediatric otoscopy skills. We have changed the Background Section of Abstract of the revised manuscript to the following: “The serious consequences of inaccurate diagnosis of acute otitis media have led to a call for greater education to develop proficient pediatric otoscopy skills. Despite the clinical and educational needs, peer-reviewed standardized curricula with validated assessment instruments remain limited. This study evaluated a pediatric otoscopy curriculum incorporated into the Pediatric medical student clerkship with use of outcome measures that included assessment of skills with real patients. The objective was to determine whether students who
received the intervention would demonstrate significant gains in pediatric otoscopy skills when compared with students with only routine immersion learning exposure.”

3. Results: Please place the means +/-SD for these groups and the p-value.

Author Response: We agree with the reviewer that the Results Section should include the mean and standard deviation of the pre-intervention and post-intervention written test and skills checklist scores for the intervention group, non-intervention group, and retention group.

Author Action: We have changed the Results Section of the Abstract to the following in the revised manuscript: “Pre-intervention scores were similar for the IG and NIG for the written test (mean/SD of 12.9/2.9 for IG and 12.9/1.8 for NIG, p=0.78) and skills checklist (mean/SD of 11.1/4.4 for IG and 10.9/4.0 for NIG, p=0.88). The IG had significantly higher post-intervention scores than the NIG for the written test (mean/SD of 22.6/1.7 for IG and 13.9/2.5 for NIG, p<0.001) and skills checklist (mean/SD of 19.2/3.4 for IG and 11.0/3.8 for NIG, p<0.001). The IG also had significantly higher gain in scores than the NIG for the written test (mean/SD +9.6/2.8 for IG and +1.0/2.3 for NIG, p<0.001) and skills checklist (mean/SD of +8.1/4.8 for IG and +0.1/4.5 for NIG, p<0.001). For the RG, there was a significant decrease (p<0.001) from the post-intervention scores to retention scores (mean/SD of -7.4/2.7) but a significant increase (p<0.001) from the pre-intervention score to retention score (mean +2.6/3.3).”

4. Conclusions: Needs to be focused. In two to three sentences what do we learn from this study?

Author Response: We agree with the reviewer that the Conclusion Section needs to be more focused succinctly describing what our study showed and the potential impact of our findings on medical education.

Author Action: We have changed the Conclusion Section of the Abstract of the revised manuscript to the following: “Medical students who received a formal curriculum intervention demonstrated significant gains in pediatric otoscopy skills when compared with students with
only routine immersion learning exposure. However, learning gains diminished over time, emphasizing the need for continued practice opportunities to reinforce students’ skills. Our study provides a formal curriculum to meet identified educational gaps in the important topic of pediatric otoscopy and offers a model for teaching of other clinical skills using rigorous outcome measures including assessment of skills in real patients.”

5. Abstract: We use paired t-test when we know that the pre-test answers of student A are compared against post-test answers for the same student. No indication in the study that a code or a similar strategy was used. Then why ANOVA is used?

Author Reply: We thank the review for pointing out the unclear description of the statistical analysis in the Abstract. We did in fact use paired t-tests to compare pre-intervention, post-intervention scores, and retention scores in the intervention group, non-intervention group, and retention group (i.e. within-group comparisons). However, we used ANCOVA tests to compare pre-intervention and post-intervention scores between the intervention group and non-intervention group (i.e. between-group comparison). The reason why we used ANCOVA tests instead of simple student t-tests for the between-group comparisons is that we wanted to account for co-variables of age and gender in the statistical analysis which may have potentially influenced scores on the written test and skills checklist.

Author Response: We have changed the description of the statistical analysis in the Methods Section of the Abstract of the revised manuscript to the following: “Paired t-tests were used to compare differences in pre-intervention, post-intervention, and retention scores for the IG, NIG, and RG, while analysis of covariance tests were used to compare differences in scores between the IG and NIG.” We have modified the description of the statistical analysis in the Methods Section of the revised manuscript to the following: “Analysis of covariance (ANCOVA) tests was used to compare pre-intervention, post-intervention, and gain in scores between the IG and NIG, with adjustment for potential co-variates of age and gender.”

6. Key words: Omit validity (you have not tested the validity), you may add "Learning about diagnosis" "Curriculum."
Author Response: We agree with the recommendations of the reviewer regarding the key words.

Author Action: We have changed the key words of the revised manuscript to the following: Clinical Assessment, Pediatric Otoscopy, Acute Otitis Media, Curriculum, and Learning about Diagnosis.”

7. The word "multi-modal" is not needed as we all use a range of teaching/learning methods.

Author: We agree with the reviewer that the word “multi-modal” is not needed to describe the curriculum intervention.

Author Action: We have deleted the word “multi-modal” to describe the curriculum intervention throughout the revised manuscript. In addition, we deleted the paragraph in the Discussion Section discussing the multi-modal nature of the curriculum.

8. Introduction: First sentence should be followed with a sentence showing figures for what was stated plus a recent reference.

Author Response: We agree with the reviewer regarding the need to describe the incidence of acute otitis media in the general population.

Author Action: We have modified the first sentence in the Introduction Section of the revised manuscript to the following: Acute otitis media (AOM) is the most frequently diagnosed illness in children. “A recent prospective observational cohort study performed at multiple institutions in five European countries has documented an incidence of AOM of 256 cases per 1000 persons-years [1].”
9. Introduction: First paragraph, is the problem over diagnosis or under diagnosis of AOM? There is mixed statements. Please, be specific and link this with the rationale for the study. Why do we need such study?

Author Response: We agree with the reviewer that it must be clearly stated whether the problem with inaccurate diagnosis of acute otitis media is over-diagnosis or under-diagnosis and that this deficiency must be linked to the rationale of the study. Please refer to our response to comment 10 regarding the need for a strong rationale for the study.

Author Action: We have added the following sentences to the first paragraph of the Introduction Section of the revised manuscript: “AOM is the most common indication for antimicrobial therapy [3, 4]. However, otitis media with effusion (OME), a condition often misdiagnosed as AOM and which does not require antibiotics, is actually the most common condition for which antibacterial agents are prescribed [5].” We have added the following sentences to the second paragraph of the Introduction Section of the revised manuscript; “Diagnostic uncertainty due to a lack of pediatric otoscopy skills has led to an over-diagnosis of AOM, which has resulted in an increased incidence of antimicrobial resistance and higher healthcare costs due to unnecessary antibiotic prescriptions and surgical referrals [5].”

10. Introduction: Please provide a strong rationale for the study with references.

Author Response: We agree with the reviewer that a strong rationale for the study is needed in the Introduction Section.

Author Action: We have completely rewritten the Introduction Section of the revised manuscript to include multiple paragraphs which step-by-step emphasize the strong rationale for our study. The first paragraph describes the fact that acute otitis media is a very common childhood disease and that it is often confused with otitis media with effusion which has a different method of treatment. The second paragraph describes the difficulty in distinguishing acute otitis media from other conditions due to nonspecific signs and symptoms, the importance of pediatric otoscopy in making the diagnosis, and the fact that acute otitis media is over-diagnosed due to diagnostic uncertainty in pediatric otoscopy leading to many adverse effects. The third paragraph describes the clinical guidelines of the American Academy of Pediatrics that there is
an urgent need for greater education on pediatric otoscopy and that this education should begin as early as possible in medical school. The final paragraph describes the limited curricula for pediatric otoscopy in the literature and the fact that no curriculum exist for medical students. We feel that the new Introduction Section provides a strong rationale for the objective of our study which was modified to the following in the revised manuscript: “To meet this educational gap with the overarching aim to impact patient care by improving the accuracy of diagnosing AOM, we evaluated a curriculum for pediatric otoscopy incorporated into the Pediatric medical student clerkship with the use of outcome measures that included assessment of skills with real patients.”

11. Introduction: (A) First paragraph: Is otoscopy the only means of accurate diagnosis, or diagnosis is based on history, clinical examination, and otoscopy? (B) Are there are groups of children at a higher risk of having AOM?

Author Response: (A) We agree with the reviewer that a better description of the methods of diagnosing acute otitis media is warranted. (B) We agree with the reviewer that a description of whether there are groups of children at high risk for acute otitis media is warranted.

Author Action: (A) We have added the following sentences to the Introduction Section of the revised manuscript: “It is essential to correctly identify children with AOM, but the diagnosis is often challenging [4, 5]. While children with AOM typically present with clinical symptoms of fever, ear pain, and irritability, these findings are nonspecific and frequently overlap with OME and viral upper respiratory infection [6, 7]. Proficient skills in pediatric otoscopy is critical for making an accurate diagnosis of AOM as the condition is confirmed by the identification of an effusion and acute inflammatory changes in the middle ear.” (B) We have added the following sentences to the Introduction Section of the revised manuscript: “Furthermore, it has been shown that up to 75% of children will develop AOM at some time before the age of 5 years [2].”

Author Reply: Unfortunately, we are unable to find a review article or meta-analysis to cite as a reference for this sentence. However, we have thoroughly reviewed the published literature on curricula for pediatric otoscopy and the diagnosis of acute otitis media. We have described all previously published studies in the Discussion Section of the revised manuscript. To our knowledge, curricula with formal standardized content and assessment instruments for medical students have not been previously described in the literature. However, we agree with the reviewer that it necessary to clearly indicate that the sentence is based on our own literature review and not on information provided by a previously published study.

Author Action: We have changed the sentence to the following in the Introduction Section of the revised manuscript: “Furthermore, to the best of our knowledge, curricula with formal standardized content and assessment instruments for medical students have not been described in the literature.”

13. Introduction: what are your research questions?

Author Response: We agree with the reviewer that a sentence describing our research question in the Introduction Section is warranted.

Author Action: We have added the following sentences to the end of the last paragraph of the Introduction Section of the revised manuscript: “To meet this educational gap with the overarching aim to impact patient care by improving the accuracy of diagnosing AOM, we evaluated a curriculum for pediatric otoscopy incorporated into the Pediatric medical student clerkship with the use of outcome measures that included assessment of skills with real patients. We hypothesize that students who received the formal curriculum intervention would demonstrate significant gains in pediatric otoscopy skills and the diagnosis of AOM when compared with students with only routine immersion learning exposure.”

14. Methods: Needs an introduction "a research design" part to explain what the bases for your study design are? And how this design can enable you to answer your research questions?
Author Response: We agree with the reviewer that the first paragraph of the Methods Section should consist of a description of the study design.

Author Action: We have added to the Methods Section of the revised manuscript the following Study Design Subsection describing the design of the study and how the design allowed us to answer our research question: “The objective of our study was to document significant gains in pediatric otoscopy skills and the diagnosis of AOM following a formal curriculum intervention. To meet this objective, medical students at the same university were divided into an intervention group (IG) performing their Pediatric clerkship at a large university hospital who received the curriculum and a non-intervention group (NIG) performing their Pediatric clerkship during the same time period at a large off-site community hospital who did not receive the curriculum. Gains in knowledge and skills over the course of the Pediatric clerkship were assessed using objective outcome measures. The study design allowed simultaneous enrollment of students at different institutions in the IG and NIG over the same time period to closely track them longitudinally, to enable outcome measures to be assessed in all students at the same time before and after the curriculum to decrease other factors that might influence post-intervention scores, and to prevent students in the NIG from becoming aware of the content of the curriculum and outcome assessment instruments through interactions with students in the IG.”

15. (A) What is the aim of having a retention group? Define the retention group? (B) How were the students selected /allocated for each group? (C) Explain how this could help in answering your research questions?

Author Response: (A) We agree with the reviewer that a better description of the retention group is warranted. (B) We agree with the reviewer that it is important to specifically describe how each group of students was selected. (C) Please refer to our response and action to comment 14 for explanation of how creation of the intervention group and non-intervention group allowed us to answer our research question. The creation of the retention group did not serve to answer the main objective of our study which was “to determine whether students who received the intervention would demonstrate significant gains in pediatric otoscopy skills when compared with students with only routine immersion learning exposure.” We created the retention group to answer an exploratory aim of whether pediatric otoscopy skills gained in the curriculum could be retained over time. The information provided by this exploratory aim will drive future studies investigating methods to better retain learned pediatric otoscopy skills over time.
Author Action: (A) We have added the following sentence to the Subjects Subsection of the Methods Section of the revised manuscript: “A retention group was created to investigate whether gains in pediatric otoscopy skills and the diagnosis of AOM following the curriculum intervention could be maintained over time. The RG consisted of 79 students (38 males and 41 females with an average age of 25.8 years) in the IG who chose to complete a survey and written test at the end of medical school. Participation in the RG was voluntary as mandated by our IRB.” (B) We have modified the sentences in the Subjects Subsection of the Methods Section of the revised manuscript to the following to more thoroughly describe the intervention and non-intervention groups and how they were selected: “The IG consisted of 100 consecutive third year medical students (47 males and 53 females with an average age 26.2 years) performing their Pediatric clerkship at a large university hospital who received the curriculum. A non-intervention group (NIG) consisted of 30 consecutive third year medical students (15 males and 15 females with an average age of 25.6 years) at the same university performing their Pediatric clerkship during the same time period at a large off-site community hospital with strong clinical, educational, and research affiliations with the university hospital. Training including the didactic lecture schedule, inpatient and outpatient clinical experiences, and educational objectives was similar for both groups except for the curriculum.”

16. Page 7: under the title "Curriculum Design". This part does not follow with "Subjects". (A) Here you should explain the design of the curriculum/ and curriculum content/teaching and learning used in the three groups described earlier. (B) You could then explain the educational basis on which you developed the new design and the pedagogy behind it.

Author Response: (A) We agree with the reviewer that a better explanation of the design of the curriculum is warranted. (B) We based our curriculum design on a formal needs assessment of a previous group of students performing their Pediatric medical student clerkship at our institution.

Author Action: (A) We have modified the Curriculum Description Subsection of the Methods Section of the revised manuscript to the following to more thoroughly describe the design of the curriculum intervention: “Based upon the needs assessment, a curriculum was developed as a two-hour “mini-lab” session performed in a clinical skills center which included a didactic lecture, a small group session focusing on clinical interpretation of tympanic membrane findings, and hands-on training. The curriculum’s content was adapted from Enhancing Proficiency in Otitis Media (ePROM), a peer reviewed web curriculum containing validated images and expert content [10]. A 12-item otoscopy skills checklist was developed which highlighted the key...
components of the approach to the pediatric ear exam and consisted of multiple content domains: discussion with the caregiver, equipment usage, distraction techniques, holding positions, and specific portions of the exam including general technique, pneumatic otoscopy, and cerumen removal. The faculty used the skills checklist to demonstrate the proper method to perform the pediatric ear exam. Students used the checklist to practice otoscopy skills on each other and on mannequins chosen to represent children of varying ages and received facilitated faculty feedback on their skills in a serial manner until they demonstrated competent technique.” (B) We have included the following sentences in the Curriculum Description Subsection of the Methods Section of the revised manuscript more thoroughly explain the educational basis of the design of the curriculum intervention: “An IRB-approved needs assessment was performed on 88 consecutive third year medical students (43 males and 45 females with an average age of 25.9 years) during the prior year to determine learning needs and preferred learning modalities (Appendix 1). Based upon the needs assessment, a curriculum was developed as a two-hour “mini-lab” session performed in a clinical skills center which included a didactic lecture, a small group session focusing on clinical interpretation of tympanic membrane findings, and hands-on training.” We have included the following description of the needs assessment in Appendix 1 of the revised manuscript: “An IRB exempt needs assessment was performed for curriculum development purposes. Between July 2008 and June 2009 at the end of their Pediatric clerkship, an 18-item Likert-type survey was administered to 88 consecutive third year medical students (43 males and 45 females with an average age of 25.9 years). It focused on learning expectations and preferred learning modalities regarding pediatric otoscopy. Response rate for the needs assessment used was 83% with 66 of the 88 students completing the survey. Ninety-seven percent of students had expected to learn how to perform the pediatric ear exam during their clerkship. Seventy-three percent of students reported anxiety when performing pediatric otoscopy, while 74% of students desired to have acquired more clinical skills. To increase their clinical skills, 89% of students preferred a “mini-lab” with hands-on training, 24% of students preferred lectures, and 44% of student’s preferred web-based learning. There was a significantly higher (p<0.05) proportion of students preferring the “mini-lab” with hands-on training to the other learning modalities.”

17. Outcome measures: (A) You need to explain how the assessment methods used/tools used will help you to answer your research questions. (B) If you are assessing knowledge, what tools did you use? For skills, what tools did you use? One of the main deficiencies in this model is the lack of assessment of behavior and communication with the patient, the authors need to respond to this deficiency, and if they cannot address it, they should add it to the limitation of the model.
Author Response: (A) We agree that a more detailed explanation of how the outcome assessment methods allowed us to answer our research question is warranted. (B) Our outcome assessment methods included a written test and assessment of pediatric otoscopy skills with real patients. The written test assessed both knowledge and clinical skills in the interpretation of different tympanic membrane findings. The skills assessment evaluated both clinical/technical skills in pediatric otoscopy (i.e. equipment usage, holding positions, general technique, pneumatic otoscopy, and cerumen removal) and behavior skills (i.e. communication with caregivers and child distraction techniques). However, we agree with the reviewer that a better description of our outcome assessment measures is warranted.

Author Reply: (A) We have added the following sentence as the first sentence in the Outcome Measures Subsection of the Methods Section of the revised manuscript: “The IG and NIG were evaluated with a written test and assessment of skills with real patients before and after the curriculum in order to determine whether students who received the intervention would demonstrate significant gains in pediatric otoscopy skills when compared with students with only routine immersion learning exposure.” (B) The following sentences were added to the Outcome Measures Subsection of the Methods Section of the revised manuscript: “The written test evaluated clinical skills in addition to actual knowledge as it contained validated images of the tympanic membrane and required the students to interpret the tympanic membrane findings..... The skills checklist assessed for both technical skills of the pediatric ear exam including equipment usage, holding positions, general technique, pneumatic otoscopy, and cerumen removal and behavior skills such as communication with caregivers and child distraction techniques [13].”

18. Assessment: It is not clear how the authors did ensure standardization of marking of students in clinical skills across different groups and different centers included in the study? What measures were taken to ensure consistency and standardization of ranking of student's skills? Did you train all examiners? Did you use standardized criteria? Did you train examiners on applying the criteria?

Author Response: We agree that all the questions regarding the 12-item skills checklist used to evaluate the pediatric otoscopy skills of students with real patients raised by the reviewer are extremely important. However, all these question have already been addressed in a manuscript we recently published in MedEdPORTAL in which we thoroughly validated our pediatric otoscopy skills checklist (Paul CR, Keeley MG, Ruebella G, Frhna JG: Standardized checklist...
for otoscopy performance evaluation: a validation study of a tool to assess pediatric otoscopy skills. MedEdPORTAL 2016, 12:10432). This manuscript was given an “Editor’s Choice” merit award by MedEdPORTAL. We feel that it would be best to reference this previously published manuscript in the current study rather than repeating details regarding the validation process.

Author Action: We have added the following sentence with reference to the Outcome Measures Subsection of the Methods Section of the revised manuscript: “The skills checklist underwent rigorous evaluation prior to its implementation including evidence of achieving feasibility, accuracy, validity, and inter-observer reliability [13].”

19. The results section should be expanded to cover three subitems: Knowledge, Clinical Skills, and Professional behavior/communication skills.

Author Response: We used a written test and skills checklist to evaluate students in the intervention group and non-intervention group. It would not be possible for us to cover the three sub-items (knowledge, clinical skills, and behavior) separately in the Results Section since both the written test and skills checklist included more than one sub-item. For example, the written test assessed both knowledge and clinical skills in the interpretation of different tympanic membrane findings. The skills checklist evaluated both clinical/technical skills in pediatric otoscopy (i.e. equipment usage, holding positions, general technique, pneumatic otoscopy, and cerumen removal) and behavior skills (i.e. communication with caregivers and child distraction techniques). If we separated the written test and skills checklist into their two individual sub-items in the Results Section, it would greatly decrease the dynamic range of the two outcome assessment measures and would thus make it extremely difficult to detect statistically significant differences in the pre-intervention and post-intervention scores and gain in scores between the intervention group and non-intervention group. However, we agree with the reviewer that a better description of our outcome assessment measures is warranted.

Author Action: The following sentences were added to the Outcome Measures Subsection of the Methods Section of the revised manuscript: “The written test evaluated clinical skills in addition to actual knowledge as it contained validated images of the tympanic membrane and required the students to interpret the tympanic membrane findings.....The skills checklist assessed for both technical skills of the pediatric ear exam including equipment usage, holding positions, general
technique, pneumatic otoscopy, and cerumen removal and behavior skills such as communication with caregivers and child distraction techniques [13].”

20. Figure 1 Should be turned into a table showing the following columns: Objectives, Content, Learning/teaching methods, Assessment tools.

Author Response: We agree with the reviewer that Figure 1 should be converted into a table.

Author Action: We converted Figure 1 into Table 2 with the rows labelled Objectives, Learning Methods, Content, and Outcome Measures and a brief description of each component of the curriculum.

21. Discussion: (A) It is not clear how the authors plan to fit this component with other components in the pediatric curriculum to ensure harmony and maintaining a balance of the curriculum content. (B) The discussion needs to have a focus.

Author Response: (A) We agree with the reviewer that an explanation of how the formal pediatric otoscopy curriculum intervention could fit in with the overall curriculum of the Pediatric medical student clerkship is warranted. (B) We agree with the reviewer that the Discussion Section needs a better focus.

Author Action: (A) We have added the following sentence to the conclusion of the revised manuscript: “The curriculum could be incorporated into the didactic lecture series included in the third year Pediatric medical student clerkship at most institutions and would provide an excellent complement to the routine immersion learning of pediatric otoscopy skills obtained in the hospital in-patient units and ambulatory clinics.” (B) We have significantly modified the Discussion Section of the revised manuscript to include multiple paragraphs which focus in on the most clinically significant findings of our study. We have also eliminated the paragraph in the Discussion Section describing the multi-modal nature of the curriculum as recommended by the reviewer. The first paragraph describes that our curriculum intervention demonstrated
significant gain in pediatric otoscopy skills, thereby addressing a well-recognized educational need. The second paragraph describes that pediatric otoscopy skills gained in our curriculum were translated into actual skills demonstrated with real patients, which is typically assumed but rarely objectively evaluated in medical education. The third paragraph compares our curriculum with other pediatric otoscopy curriculum described in the literature, highlighting its strengths. The fourth paragraph describes the regression of pediatric otoscopy skills over time in the retention group and discusses the finding in the context of previously published literature.

22. Conclusion: Needs to be rewritten. Please omit words such as "Novel" and Multi-modal" etc. Strengthen the conclusions. No references needed in the conclusion part.

Author Response: We agree with the reviewer that the conclusion needs to be completely rewritten with omission of references and words such as novel” and “multi-modal”.

Author Action: We have completely changes the conclusion paragraph of the revised manuscript to the following to describe succinctly what our study showed and the potential impact of our findings on medical education. “In conclusion, our study adds a formal curriculum intervention to the important topic of pediatric otoscopy which was evaluated using rigorous outcome measures and was found to yield significant gains including skills with real patients. The curriculum could be incorporated into the didactic lecture series included in the third year Pediatric medical student clerkship at most institutions and would provide an excellent complement to the routine immersion learning of pediatric otoscopy skills obtained in the hospital in-patient units and ambulatory clinics. However, learning gains diminished over time, emphasizing the need for continued practice opportunities to reinforce students’ skills. The educational content, multiple learning strategies, and rigorous assessment instruments described in our curriculum could be adapted for other clinical topics and other learner groups.

23. References: I noted several problems in the references:

Author Response: We thank the reviewer for noticing the mistakes in the references.
Author Action: We have double checked all references in the revised manuscript to make sure that they are correct.