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OPEN PEER REVIEW

Analyzing Patterns in Anesthesiology Residents' Exam Performance Using Data Mining Techniques

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About this report

This open peer review (OPR) report shows the public comments made on this article during peer review, by the reviewers, the associate editor and the editor-in-chief, for every revision round, together with the authors' replies. Comments appear only with the consent of the people who wrote them. Reviewers who chose to sign their report are named; the others are shown as "Referee". Comments are edited for language only, and confidential remarks to the editors are not included.

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Contents

1 **Original submission** Referee 1, Referee 2, Associate Editor, Editor-in-Chief 2

2 **Revision 1** Referee 1, Associate Editor, Editor-in-Chief 5

Authors' reply to reviewers 6

Reviewer and editor comments 12

1 Original submission

4 comments · 5 Oct 2024 – 11 Oct 2024

Referee 1 Reviewer

MAJOR REVISION 5 Oct 2024

Dear Associate Editor
I thank the authors and express my appreciation to the researchers.
I reviewed the manuscript entitled " Unveiling Key Patterns in Anesthesiology Residents' Annual Examinations Through Advanced Data Mining Techniques".
It qualifies as a cross-sectional study, as it analyzes data from a specific point in time, focusing on residents' performance during a set period (from September 2022 to June 2023).
I suggest that the authors revise it based on the comments:

-Some sentences lack references. All sentences quoted from other articles must have references at the end.
For example:
Studies have demonstrated a “moderate to strong correlation” between the results of ITE with “subsequent performance” in the national board exams” in different subspecialties.
-Introduction:
The introduction provides some background but lacks detailed references supporting the relevance of using the Apriori Algorithm in medical education assessment. Including more literature supporting the relationship between frequent pattern mining and exam performance would strengthen the rationale.

-Although the objective of the study is mentioned, it is not clearly defined with specific hypotheses. For instance, what specific patterns were you expecting to find in residents’ exam performance, and how do these relate to medical education improvement?

- The statistical methods used to extract patterns (e.g., Apriori Algorithm) are mentioned but not sufficiently explained. A more detailed explanation of how the algorithm was applied, the rationale for using it, and the threshold for the Min-Support value (0.41) is required.

- The manuscript lacks detailed demographic data on the residents. Information such as age, gender, previous educational background, and residency year is missing. These are important because they might affect exam performance and should be reported separately for different resident categories (CA-1 to CA-4). Additionally, the frequency and distribution of performance scores across these groups should be more granular to allow better interpretation.

Discussion:

-We would prefer to state the aim or the title of an article in the first line, and in the second and third lines we must mention the main finding(s). For the rest of this part, any gap, question, or hypothesis should be stated, followed by references to other studies.

-The discussion provides a reasonable interpretation of the results but does not tie them back to the study’s specific objectives. For example, the link between frequent patterns and the final exam outcomes needs to be more explicitly tied to the educational objectives. Did the frequent patterns reflect gaps in teaching, exam structure, or resident knowledge?

Referee 2 Reviewer MAJOR REVISION 10 Oct 2024

Comments and Suggestions
1. Scope of the Journal:
o Ensure that the article aligns with the journal's focus on medical education and data mining applications within that context. Consider briefly discussing the relevance of the findings to broader educational practices or future research directions.
2. Novelty:
o Highlight the unique aspects of your research more clearly in the introduction and discussion. What specific gaps in the current literature does your study address?
3. Title Appropriateness:
o The title reflects the content well, but consider simplifying it for clarity. For instance, "Analyzing Patterns in Anesthesiology Residents' Exam Performance Using Data Mining Techniques" could be more straightforward.
o Ensure that abbreviations like "DACCPM" are defined in the introduction, as this helps improve clarity for readers unfamiliar with the terms.
4. Keywords Selection:
o Ensure that keywords are selected from MESH (Medical Subject Headings) for improved discoverability. Consider adding keywords related to educational assessment, data mining, and residency training.
5. Clarity of Objectives:
o The objectives of the study should be stated more explicitly in the introduction. Consider rephrasing to clearly delineate the aims and objectives of the research.
6. Introduction Content:
o While the introduction mentions “What we know” and “What we don’t know,” it could benefit from a more structured approach. Clearly outline the current state of research in anesthesiology residency training, followed by the specific aims of your study.
Additional Comments
7. Ethical Approval:
o While you mention ethical approval, consider adding a brief statement on how participant confidentiality was maintained, as this is crucial in medical research.
8. Study Design:
• Provide a clearer description of the study design and methods in the Methods section. Readers may benefit from a flowchart or diagram illustrating the study process.
9. Statistical Analysis:
• Describe the statistical methods used for data analysis in more detail. This is crucial for reproducibility and understanding the significance of the findings.
10. Results Presentation:
• Ensure that the results are presented logically, focusing on the most critical findings first. Consider using tables or figures to summarize key data points clearly.
11. Discussion Clarity:
• In the discussion, explicitly relate your findings to existing literature. This will help contextualize your results and emphasize their importance.
12. Conclusion Justification:
• Ensure that the conclusions drawn from the study are explicitly supported by the results. Consider suggesting specific actions or recommendations based on your findings.
13. References Format:
• Review the references to ensure they adhere to the journal’s formatting guidelines. Check for consistency in citation style throughout the manuscript.

Associate Editor

MAJOR REVISION 11 Oct 2024

Dear EIC,
I thank the authors and express my appreciation to the researchers. This is a cross-sectional study, which analyzes data from a specific point in time, focusing on residents' performance during a set period (from September 2022 to June 2023).
The manuscript presents valuable research. But some revisions are needed. The authors should revise it based on the reviewers' comments.

Also, a minor change should be made to the abstract:

-A summary of the statistical analysis results should be mentioned in the results section of the ABSTRACT.

Editor-in-Chief

MAJOR REVISION 11 Oct 2024

Dear Author,
Thank you for submitting the article. It needs some revision. Please revise it based on the reviewers' and AE's comments.

2

Revision 1

AUTHORS' RESPONSE TO REVIEWERS

Authors' reply to reviewers

The next pages contain the authors' point-by-point reply to the comments of this revision round, as submitted with the revised manuscript. It is published as the authors wrote it.

Reviewer 1:

Dear Author

Thank you for your interesting study. Here are a few points for your consideration:

Comment	Answer	Page
1. The study lacks a clear reference to the taxonomy of your questions in relation to the taxonomy of the board exam questions. It would be beneficial to discuss the degree of similarity between these two taxonomies.	Exactly Correct Thank you for the great comment. It is fully addressed	2nd paragraph of methods
2. Drawing conclusions about the effect of the number of exams on board exam scores based solely on data from one academic year may not be sufficient. To establish a more robust understanding, it would be helpful to include data from another academic year with a lower number of exams.	Exactly Correct. This study was the baseline; i.e. the pilot for a greater one. We have planned to continue the process. This is one study limitation.	Limitation No 1
3. Additionally, it is not appropriate to conclude which topics are deemed important for the board exam based solely on the scores and their relationships. A more comprehensive analysis would strengthen your claims in this area.	Exactly Correct. This is again one of the points that should be addressed in the next study. This is one study limitation.	Limitation No 2

Reviewer 2:

Thank you for having me to review manuscript 151686;

Comment	Answer	Page
1-There is no mention of utilizing “AI” which has been noted as a keyword in abstract section in any part of the manuscript.	Thank you for the great comment. We addressed the comment.	The introduction and the methods section
2-What other data mining techniques could be explored?	Thank you for the great comment. We addressed the comment.	The methods section Under the “Selection of data mining algorithm”
3-The authors have not addressed any potential sources of bias.	Thank you for the great comment. We addressed the comment.	The last paragraph in methods
4-How can the findings inform residency program improvements?	Thank you for the great comment. We addressed the comment.	The 1st paragraph of the conclusion

5-Any other missing data in relation to the in-training exam to be addressed?	Thank you for the great comment. We addressed the comment.	The 3rd limitation of the study under limitations.
6-It is recommended to use a flow diagram for participants in the study.	Thank you for the great comment. We addressed the comment.	We described the methods with in details.
7-If characteristics of participants are not important, better be mentioned.	Thank you for the great comment. We addressed the comment.	The 4th limitation of the study under limitations.
8-Are there any limitations in using self-reported exam results?	Thank you for the great comment. We addressed the comment.	The 5th limitation of the study under limitations.

Regards

Reviewer 3:

Dear Associate Editor

Thanks to the authors and appreciation to the researchers.

I reviewed manuscript entitled " Unveiling Key Patterns in Anesthesiology Residents' Annual Examinations Through Advanced Data Mining Techniques".

It qualifies as a cross-sectional study, as you analyze data from a specific point in time, focusing on residents' performance during a set period (from September 2022 to June 2023).

I suppose to Authors revise it based on comments:

Comment	Answer	Page
-Some sentences lack references. All sentences quoted from other articles must have references at the end of themselves. For example: Studies have demonstrated a “moderate to strong correlation” between the results of ITE with “subsequent performance” in the national board exams” in different subspecialties.	Thank you for the great comment. We addressed the comment.	The 1st paragraph of the introduction.
The introduction provides some background but lacks detailed references supporting the relevance of using the Apriori Algorithm in medical education assessment. Including more literature supporting the relationship between frequent pattern mining and exam performance would strengthen the rationale.	Thank you for the great comment. We addressed the comment.	The 3rd paragraph of the introduction.

-Although the objective of the study is mentioned, it is not clearly defined with specific hypotheses. For instance, what specific patterns were you expecting to find in residents' exam performance, and how do these relate to medical education improvement?	Thank you for the great comment. We addressed the comment.	The 2nd paragraph of methods and the 1st paragraph of the conclusion
- The statistical methods used to extract patterns (e.g., Apriori Algorithm) are mentioned but not sufficiently explained. A more detailed explanation of how the algorithm was applied, the rationale for using it, and the threshold for the Min-Support value (0.41) is required.	Thank you for the great comment. We addressed the comment.	In the methods; under the "Selection of data mining algorithm"
- The manuscript lacks detailed demographic data on the residents. Information such as age, gender, previous educational background, and residency year is missing. These are important because they might affect exam performance and should be reported separately for different resident categories (CA-1 to CA-4). Additionally, the frequency and distribution of performance scores across these groups should be more granular to allow better interpretation.	Thank you for the great comment. We addressed the comment.	These are presented in Table 4.
We would rather to write the aim or the title of an article as the first line, and in the second and third lines we must mention the main(s) finding(s) and for the rest of this part, any gap, question, hypothesis should be declared and then allude to other studies.	Thank you for the great comment. We addressed the comment.	The 1st paragraph of the discussion.
The discussion provides a reasonable interpretation of the results but does not tie them back to the study's specific objectives. For example, the link between frequent patterns and the final exam outcomes needs to be more explicitly tied to the educational objectives. Did the frequent patterns reflect gaps in teaching, exam structure, or resident knowledge?	Thank you for the great comment. We addressed the comment.	The 1st page of the discussion.

Reviewer 4:

Comments and Suggestions

Comment	Answer	Page
1. Scope of the Journal: Ensure that the article aligns with the journal's focus on medical education and data mining applications within that context. Consider briefly discussing the relevance of the findings to broader educational practices or future research directions.	Thank you for the great comment. We checked the journal scope again. The journal has published articles both regarding medical education and AI.	---------
2. Novelty: Highlight the unique aspects of your research more clearly in the introduction and discussion. What specific gaps in the current literature does your study address?	Thank you for the great comment. We addressed the comment.	3rd paragraph of the Introduction and the last paragraph of the Conclusion.
3. Title Appropriateness: The title reflects the content well, but consider simplifying it for clarity. For instance, "Analyzing Patterns in Anesthesiology Residents' Exam Performance Using Data Mining Techniques" could be more straightforward.	Thank you for the great comment. We addressed the comment.	Title was changed per your comment
Ensure that abbreviations like "DACCPM" are defined in the interdiction, as this helps improve clarity for readers unfamiliar with the terms.	Thank you for the great comment. We addressed the comment.	ALL the abbreviations are fully addressed in the introduction.
4. Keywords Selection: Ensure that keywords are selected from MESH (Medical Subject Headings) for improved discoverability. Consider adding keywords related to educational assessment, data mining, and residency training.	Thank you for the great comment. We addressed the comment.	These are addressed at the end of the abstract
5. Clarity of Objectives: The objectives of the study should be stated more explicitly in the introduction. Consider rephrasing to clearly delineate the aims and objectives of the research.	Thank you for the great comment. We addressed the comment.	These are addressed at the beginning of the methods section
6. Introduction Content: While the introduction mentions “What we know” and “What we don’t know,” it could benefit from a more structured approach. Clearly outline the current state of research in anesthesiology residency training, followed by the specific aims of your study.	Thank you for the great comment. We addressed the comment.	The introduction is revised per instructions
7. Ethical Approval:	Thank you for the great	These are

While you mention ethical approval, consider adding a brief statement on how participant confidentiality was maintained, as this is crucial in medical research.	comment. We addressed the comment.	addressed at the methods section under ethical considerations
8. Study Design: • Provide a clearer description of the study design and methods in the Methods section. Readers may benefit from a flowchart or diagram illustrating the study process.	Thank you for the great comment. We addressed the comment.	We described the methods with in details.
9. Statistical Analysis: • Describe the statistical methods used for data analysis in more detail. This is crucial for reproducibility and understanding the significance of the findings.	Thank you for the great comment. We addressed the comment.	We described the methods with in details.
10. Results Presentation: • Ensure that the results are presented logically, focusing on the most critical findings first. Consider using tables or figures to summarize key data points clearly.	Thank you for the great comment. We addressed the comment.	These are addressed in the results.
11. Discussion Clarity: • In the discussion, explicitly relate your findings to existing literature. This will help contextualize your results and emphasize their importance.	Thank you for the great comment. We addressed the comment.	The discussion has been critically revised.
12. Conclusion Justification: • Ensure that the conclusions drawn from the study are explicitly supported by the results. Consider suggesting specific actions or recommendations based on your findings.	Thank you for the great comment. We addressed the comment.	The conclusion is fully revised.
13. References Format: • Review the references to ensure they adhere to the journal's formatting guidelines. Check for consistency in citation style throughout the manuscript.	Thank you for the great comment. We addressed the comment.	This is addressed in the reference formatting

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Associate Editor 1:

Dear EIC,

Thanks to the authors and appreciation to the researchers. This is a cross-sectional study, as which analyze data from a specific point in time, focusing on residents' performance during a set period (from September 2022 to June 2023).

The manuscript is a valuable research. But some revisions are needed. Authors should revise it based on Reviewers comments.

Also minor change should be done in abstract:

-Summary of Statistical analysis results should be mention in result section of ABSTRACT.

Thank you for the comment. We have done this comment.

2 Revision 1

3 comments · 2 Nov 2024 – 29 Nov 2024

Referee 1 Reviewer

ACCEPT 2 Nov 2024

Dear AE,
I reviewed the manuscript again. The great effort in improving the manuscript is highly appreciated.
The authors have addressed all comments.
Thank you

Associate Editor

ACCEPT 29 Nov 2024

Dear EIC,
I reviewed the manuscript again. The great effort in improving the manuscript is highly appreciated.
The authors have addressed all comments.
Thank you

Editor-in-Chief

ACCEPT 29 Nov 2024

Dear AUTHOR,
We appreciate your attentiveness and prompt response to the reviewer's feedback. The article is acceptable at this stage.
Sincerely;