Innovative Journal of Pediatrics
Volume 34 · Issue 5 · e143355

OPEN PEER REVIEW

Real-Time Monitoring of Lower Limb Oxygen Saturation in Children with Indwelling Catheters Using Near-Infrared Spectroscopy to Assess the Risk of Deep Vein Thrombosis and Nursing Strategies

Shanshan Wang, Linxi He, Xiaoyu Zhang

SUBMITTED	REVISED	ACCEPTED	DOI
25 Nov 2023	26 Jun 2024	28 Jun 2024	10.5812/ijp-143355

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.

More about open peer review: brieflands.com/knowledgebase/opr

Contents

1 **Original submission** Referee 1, Associate Editor 2
2 **Revision 1** 4
Authors' reply to reviewers 5
Reviewer and editor comments 21
3 **Revision 2** Referee 1 22
Authors' reply to reviewers 23
Reviewer and editor comments 25

1 Original submission

2 comments · 19 Jan 2024 – 26 Jan 2024

Referee 1 Reviewer

MINOR REVISION 19 Jan 2024

Dear authors, thank you for your submission. Following are my comments on your manuscript:

1) Try not to use abbreviations in the title.

2) Based on our journal guideline, correct the subtitles of your manuscript:
- Add the title “Background and objectives” to the beginning of the manuscript and assign the number “1” to this section. Accordingly, change the number of “material and methods” to 2 and divide this section into subsections: 2.1, 2.2, 2.4, and…
- Change the title of the “conclusion part” to “discussion” in the body of your manuscript and add the “conclusion” section too.

3) The explanation of the sex and age ratio and the statistical results do not belong in the material and methods section. They are part of the results. So, remove these paragraphs from this section and move them to the results:
- Among the 80 patients, the age range was 28d-14 years, with an average age of (8.61±2.51) years, and a gender ratio of 43:37.
- The general data of the two groups of children showed no statistical significance (P>0.05), indicating comparability.

4) Please add the ETHICS CODE of the study.

5) What do you mean by “unplanned extubation” in this sentence?
“Properly secure the catheter to avoid unplanned extubation or bleeding.”

6) Add the control group to table 6.

Associate Editor

MAJOR REVISION 26 Jan 2024

Dear authors, thank you for your submission. The following comments identify changes or clarifications needed in your manuscript:
1) Please do not use abbreviations in the title.
2) Based on our journal's guideline, correct the subtitles of your manuscript:
- Add the title “Background and objectives” to the beginning of the manuscript and assign the number “1” to this section. Change the number of “material and methods” to number 2 accordingly, and divide this section into: 2.1, 2.2, 2.4, and …
- Change the title of the “conclusion part” to “discussion” in the body of your manuscript and add the “conclusion” section too.
3) The explanation of the sex and age ratio and the statistical results do not belong to the material and methods section. They are part of the results. So, remove these paragraphs from this section and move them to the results:
- Among the 80 patients, the age range was 28d-14 years, with an average age of (8.61±2.51) years, and a gender ratio of 43:37.
- The general data of the two groups of children showed no statistical significance (P>0.05), indicating comparability.

4) Please add the ETHICS CODE of the study.
5) What do you mean by “unplanned extubation” in this sentence?
“Properly secure the catheter to avoid unplanned extubation or bleeding.”
6) Add the control group to table 6.

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.

Reviewers' Comments:

Reviewer 1:

Dear authors, thank you for your submission. Following are my comments on your manuscript:

1) Try not to use abbreviations in the title.

Reply:Editor teacher: Thank you for your valuable advice. For your shortcomings, you have modified the title and subtitle, the red part of the text is the modification content,the yellow part is the deletion content.

~~**DVT Risk Analysis and Nursing Strategies for Lower Limb crSaO2 Detection in Children with Indwelling Catheters Using NIRS**~~

Real Time Monitoring of Lower Limb Oxygen Saturation in Children with Indwelling Catheters Using Near-Infrared Spectroscopy to Assess the Risk of Deep Vein Thrombosis and Nursing Strategies

~~**Running title：DVT Risk Analysis and Nursing Strategies for Lower Limb crSaO2 Detection in Children with Indwelling Catheters Using NIRS**~~

Running title: Real Time Monitoring of Lower Limb Oxygen Saturation in Children with Indwelling Catheters Using Near-infrared Spectroscopy for Risk Analysis of Deep Vein Thrombosis and Nursing Strategies

2) Based on our journal guideline, correct the subtitles of your manuscript:

- Add the title of “Background and objectives” to the beginning of the manuscript and assign number “1” to this section. Correct the number of “material and methods” to number 2, consequently, and divide this section into: 2.1, 2.2, 2.4, and…

- Change the title of the “conclusion part” to “discussion” in the body of your manuscript and add the “conclusion” section too.

Reply: Hello, editor teacher, for you to modify, I said my understanding of this guide standard, this has increased background and target number "1", "data and method number" 2 ", the result number" 3 ", discussion number" 4 "," 5 " and conclusion content, and in the serial number branch content increase level 2,3,4 title serial number, the red part of the text is the modification content.

1 Background and objectives
2 Materials and methods

2.1 General Information

2.2 Inclusion and Exclusion Criteria

2.3 Methods

2.3.1 Survey methods

2.3.2 Research method

2.3.3 Control group

2.3.4 Study group

2.3.5 Observed indicators

2.3.5.1 Biochemical examination:

2.3.5.2 Symptoms related to lower limb DVT:

2.4 Quality control

2.5 Data collection

2.6 Statistical analysis

3 Results

3.1 Single factor analysis of DVT in critically ill children undergoing catheterization

3.2 Logistic regression analysis of DVT in critically ill children with catheterization

3.3 Logistic regression analysis on the impact of DVT on critically ill children

3.4 Comparison of four coagulation indicators between two groups of patients at different time periods

3.5. Comparison of lower limb DVT related symptoms between two groups of patients

4 Discussion

5. Conclusion

Real time monitoring of lower limb oxygen saturation in children with indwelling catheters using near-infrared spectroscopy can effectively assess the risk of deep vein thrombosis. The change in blood oxygen saturation may become an important indicator for predicting DVT, thus helping to take effective nursing measures in a timely manner. This monitoring method does not require invasive operations, reduces the pain of children, and can monitor lower limb blood oxygen saturation in real-time and continuously, providing strong evidence for the prevention and treatment of deep vein thrombosis. Therefore, it is recommended to widely apply this monitoring method in clinical practice to improve the nursing effectiveness of pediatric patients and reduce the incidence of DVT.

3) The explanation of sex and age ratio and also statistical results do not belong to the material and methods section. They are part of the results So, remove these paragraphs from this section and move them to results:

- Among the 80 patients, the age range was 28d-14 years, with an average age of (8.61±2.51) years, and a gender ratio of 43:37.

- The general data of the two groups of children showed no statistical significance (P>0.05), indicating comparability.

Reply: Hello, editor teacher, I am sure of your revision opinions. By reading the shortcomings of similar documents in the past, the author has deleted the relevant contents of the materials and methods,the yellow part is the deletion content.

80 children with indwelling catheters admitted to the first pediatric intensive care unit of our hospital from January 2022 to December 2022 were selected as the study subjects. According to ultrasound imaging examination, DVT was divided into two groups: DVT group (n=20) and non DVT group (n=60). Sixty non-DVT patients were randomly divided into a study group and a control group using a random number table method, with 30 patients in each group. Both groups of children's families were aware of the purpose of this survey and signed informed consent forms. This study is in accordance with the Declaration of Helsinki [10] and has been approved by the Medical Ethics Committee.

4) Please add the ETHICS CODE of the study.

5) What do you mean by “unplanned extubation” in this sentence?

“Properly secure the catheter to avoid unplanned extubation or bleeding.”

Reply: Hello, editor teacher, through reading the content of the article, I found the text of the article, thank you for your feedback,the red part of the text is the modification content,the yellow part is the deletion content.

2.3.3 Control group The control group was given routine nursing measures. After catheterization, the puncture site of the catheterization was cleaned and sterile dressings were replaced at regular intervals every day.

6) Add the control group to table 6.

Reviewer 2:

Based on my review, here are my comments on the original research article "DVT Risk Analysis and Nursing Strategies for Lower Limb crSaO2 Detection in Children with Indwelling Catheters Using NIRS":

- The main weakness I see in the results is the lack of any baseline comparison between the study and control groups prior to the intervention. The groups are said to be comparable based on general characteristics, but no statistical analysis is provided to confirm there were no significant differences at baseline in the coagulation measures. This should be added.

- The discussion could be improved by comparing the study coagulation

results to reference ranges and values from other relevant studies. This would provide more context.

- The authors should discuss any limitations of the convenience sampling method and lack of blinding.

- More information on the mechanisms linking the nursing interventions to the coagulation changes observed would strengthen the clinical implications.

Reply: Hello, Editor teacher, thank you for your valuable comments, I hereby reply to the above three comments. For the above comments, firstly, when comparing the reference range and value of others, the discussion part of the paper is presented in a red background; secondly, the coagulation index has informed T0 as the baseline data of 3d before catheterization (no catheterization) in the above biochemical examination; finally, the mechanism of nursing intervention and the change of coagulation index is presented in a red background in the discussion,the yellow part is the deletion content.

And this time, non DVT patients were randomly divided into two groups and corresponding nursing measures were carried out. The results showed that the four coagulation indicators of the study group and two groups of patients at different time periods were significantly better than

the control group and the same group before intervention (P<0.05). This indicates that nursing measures based on DVT risk grading for lower limb crSaO2 testing in children with indwelling catheters can significantly improve the risk of developing DVT. Research by Yu X et al. has shown that the formation of DVT is mainly due to impaired coagulation function, which is consistent with the results of this study. Based on this, this study analyzed the impact of nursing measures on DVT in children with venous catheterization [14].

Nursing measures are more targeted under the guidance of NIRS technology, which can implement continuous monitoring of tissue perfusion. And this technology fully considers the diversity of human tissue morphology, utilizes light sources and detectors to closely contact the skin, and adopts the commonly used Bolton in biological tissues with particularly low water absorption. The probe drives the light source to collect data and transmit data on demand through the circuit function, which can fully reflect the hemodynamic parameters and the concentration of free radicals in Arteriole, capillaries, and Arteriole, and measure the actual value of $crSaO_2$ in the lower limbs after tube placement. This time, with a benchmark of >60%, an upward fluctuation of 10% is considered risk-free, and every downward fluctuation of 10% increases one level of risk. For risk-free children, basic care is provided,

while for other risk levels, personalized differentiated nursing plans are developed through interdisciplinary team collaboration. Low risk children are evaluated for issues such as compression or posture; For moderate risk, consider whether hypothermia occurs and implement temperature protection measures. The Dietitian and the rehabilitation teacher should specify personalized nutritional support and passive limb movement programs according to the age of the children; If the risk is high, anticoagulant treatment should be given. And after 2 days, the risk level will be re evaluated. Children who are still at high risk will consider whether to remove the indwelling catheter, and corresponding plans will be implemented for those who descend to high risk [17]. Passive exercise with different lower limb $crSaO_2$ values can stimulate sympathetic nervous system excitation, downregulate inflammatory factor expression, promote endothelial function recovery, activate coagulation indicators such as TT, APTT, PT, enhance limb aerobic metabolism, and promote blood circulation. The individualized plan of the Dietitian makes the nutrients in the food quickly absorbed, increases body mass and immune function, inhibits or weakens inflammatory inflammatory factors, and reduces the inflammatory reaction caused by mechanical injury after catheterization. Furthermore, it can prevent the risk of DVT occurrence [18] and reduce the incidence of DVT related symptoms such as leg pain, skin redness, elevated skin temperature, limb swelling, and limb stiffness

in children after catheterization.

Associate Editor's Comments:

Associate Editor 1:

Dear authors, thank you for your submission. Following are comments to change or clarify on your manuscript:

1) Please do not to use abbreviations in the title.

Reply:Editor teacher: Thank you for your valuable advice. For your shortcomings, you have modified the title and subtitle, the red part of the text is the modification content,the yellow part is the deletion content.

~~**DVT Risk Analysis and Nursing Strategies for Lower Limb crSaO2 Detection in Children with Indwelling Catheters Using NIRS**~~

Real Time Monitoring of Lower Limb Oxygen Saturation in Children with Indwelling Catheters Using Near-Infrared Spectroscopy to Assess the Risk of Deep Vein Thrombosis and Nursing Strategies

~~**Running title：DVT Risk Analysis and Nursing Strategies for Lower Limb crSaO2 Detection in Children with Indwelling Catheters Using**~~

~~**NIRS**~~

Running title：Running title: Real Time Monitoring of Lower Limb Oxygen Saturation in Children with Indwelling Catheters Using Near-infrared Spectroscopy for Risk Analysis of Deep Vein Thrombosis and Nursing Strategies

2) Based on our journal guideline, correct the subtitles of your manuscript:

- Add the title of “Background and objectives” to the beginning of the manuscript and assign number “1” to this section. Correct the number of “material and methods” to number 2, consequently, and divide this section into: 2.1, 2.2, 2.4, and…

- Change the title of the “conclusion part” to “discussion” in the body of your manuscript and add the “conclusion” section too.

Reply: Hello,editor teacher,for you to modify, I said my understanding of this guide standard, this has increased background and target number "1", "data and method number" 2 ", the result number" 3 ", discussion number" 4 "," 5 " and conclusion content, and in the serial number branch content increase level 2,3,4 title serial number,the red part of the text is

the modification content,the yellow part is the deletion content.

1 Background and objectives

2 Materials and methods

2.1 General Information

2.2 Inclusion and Exclusion Criteria

2.3 Methods

2.3.1 Survey methods

2.3.2 Research method

2.3.3 Control group

2.3.4 Study group

2.3.5 Observed indicators

2.3.5.1 Biochemical examination:

2.3.5.2 Symptoms related to lower limb DVT:

2.4 Quality control

2.5 Data collection

2.6 Statistical analysis

3 Results

3.1 Single factor analysis of DVT in critically ill children undergoing catheterization

3.2 Logistic regression analysis of DVT in critically ill children with catheterization

3.3 Logistic regression analysis on the impact of DVT on critically ill

children

3.4 Comparison of four coagulation indicators between two groups of patients at different time periods

3.5. Comparison of lower limb DVT related symptoms between two groups of patients

4 Discussion

5. Conclusion

Real time monitoring of lower limb oxygen saturation in children with indwelling catheters using near-infrared spectroscopy can effectively assess the risk of deep vein thrombosis. The change in blood oxygen saturation may become an important indicator for predicting DVT, thus helping to take effective nursing measures in a timely manner. This monitoring method does not require invasive operations, reduces the pain of children, and can monitor lower limb blood oxygen saturation in real-time and continuously, providing strong evidence for the prevention and treatment of deep vein thrombosis. Therefore, it is recommended to widely apply this monitoring method in clinical practice to improve the nursing effectiveness of pediatric patients and reduce the incidence of DVT.

3) The explanation of sex and age ratio and also statistical results do not belong to the material and methods section. They are part of the results

So, remove these paragraphs from this section and move them to results:

- Among the 80 patients, the age range was 28d-14 years, with an average age of (8.61±2.51) years, and a gender ratio of 43:37.

- The general data of the two groups of children showed no statistical significance (P>0.05), indicating comparability.

Reply: Hello, editor teacher, I am sure of your revision opinions. By reading the shortcomings of similar documents in the past, the author has deleted the relevant contents of the materials and methods ，the red part of the text is the modification content,the yellow part is the deletion content.

80 children with indwelling catheters admitted to the first pediatric intensive care unit of our hospital from January 2022 to December 2022 were selected as the study subjects. According to ultrasound imaging examination, DVT was divided into two groups: DVT group (n=20) and non DVT group (n=60). Sixty non-DVT patients were randomly divided into a study group and a control group using a random number table method, with 30 patients in each group. Both groups of children's families were aware of the purpose of this survey and signed informed consent forms. This study is in accordance with the Declaration of Helsinki [10] and has been approved by the Medical Ethics Committee.

4) Please add the ETHICS CODE of the study.

5) What do you mean by “unplanned extubation” in this sentence?

“Properly secure the catheter to avoid unplanned extubation or bleeding.”

Reply: Hello, editor teacher, through reading the content of the article, I found the text of the article, thank you for your feedback,the red part of the text is the modification content,the yellow part is the deletion content.

2.3.3 Control group The control group was given routine nursing measures. After catheterization, the puncture site of the catheterization was cleaned and sterile dressings were replaced at regular intervals every day.

6) Add the control group to table 6.

Associate Editor 2:

Your manuscript was reviewed by our reviewers. The reviewers have raised concerns regarding the manuscript, and therefore, your paper is not acceptable for publication in this format. However since the reviewers do

find some merit in the paper, I would be willing to reconsider if you wish to undertake major revisions and re-submit, addressing the referees' concerns.

Please note that resubmitting your manuscript does not guarantee acceptance, and that your resubmission will be subject to a re-review before a decision is rendered.

Reply: Hello teacher, thank you for your valuable advice, thank you for your recognition of the advantages of this article, this article is willing to revise your opinion seriously,the yellow part is the deletion content.

2 Revision 1

0 comments

No public comments in this round.

3

Revision 2

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.

Reviewers' Comments:

Reviewer 1:
I reviewed the second revision of the article. All the requested changes applied, and the paper also upgraded in the whole sighting.
I have no more comments.
Reply: Thank you for your recognition of the professional skills and writing level of this article.

Reviewer 2:
dear authors, the corrections were done properly.
my only concern is "table 6", please add the term "control group" to table 6 in the proper row (second row).
Reply comment: Make my article more rigorous, and this time check the group issue.

Associate Editor's Comments:
Associate Editor 1:
This paper needs some minor revision.

EIC Decision:
In the second round, the reviewer's and associate editor's comments on your work have now been received. I now have the reports of the Referees, which suggest that your manuscript needs some minor corrections.
Reply: Based on your and the commentator's feedback, we have made the necessary modifications this time.

Control of Figures: FAILED

Figures are missing.
The Figures should be uploaded as separate files in the "Files" part of the submission.
Reply: I have been uploaded the figures as separate files to the submission system.

Control of Tables: FAILED

Tables 2 and 4 are not mentioned/referenced in the text correctly (or you have forgotten to mention one or more tables in the article body). Please mention/insert the Table(s) in the text consecutively.
Reply comment: Hello editor, thank you for taking responsibility for my manuscript and promptly discovering errors for me. The full text table numbers have been checked this time.

Writing the ethical approval code is mandatory in all Original articles on people, medical records, and human or animal samples.
This code must be linked to a webpage showing the details of approval.

Examples:

Correct:

"This study is approved under the ethical approval code of .... IC-23456 (webpage of ethical approval code is: http://www.URL.com/IC-23456) ...."

We do NOT accept these phrases:

This study was approved by our ethical committee.

We accepted all rights of Helsinki protocol in our study.

Reply: Ethics approval and consent to participate

confirming that informed consent was obtained from all subjects and/or their legal guardian(s); this includes information regarding informed consent obtained from the study participant's parent or legal guardian for any participant below the age of consent. Confirmation that the guidelines outlined in the Declaration of Helsinki were followed.

The implementation of this work had been approved by the ethics committee of ShengJing Hospital of China Medical University (Approval No. 2022PS109J)

Control of Authors' Contribution: FAILED

In "Authors' Contribution," the first and last name of authors must be written only by capital letters of an abbreviation like S.M.

Reply: Author Contributions: Study concept and design: S. S. W., and L. X. H.; analysis and interpretation of data: S. S. W., and X. Y. Z.**;** drafting of the manuscript: L. X. H.**;** critical revision of the manuscript for important intellectual content: X. Y. Z.. statistical analysis: S. S. W..

3 Revision 2

1 comment · 28 Jun 2024

Referee 1 Reviewer

ACCEPT 28 Jun 2024

Thank you for the third edition. All the requested changes have been applied.