Author’s response to reviews

Title: Nurse staffing in large general hospitals in China: An observational study

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Author’s response to reviews:

Dear Editor,

Thank you for this opportunity to revise our paper. We have revised according to the comments from the editorial committee and the external reviewers. Attached below are our point-by-point responses.

Sincerely

Weiyan Jian

Reviewer 1 Comments for Author

1. Interesting article about a subject of growing interest worldwide. It is interesting to see the application in China. In literature both metrics are used patient-to-nurse ratio and nurse-to-patient ratio. p.2 line24 "Date was collected with questionnaires among" should be "Data were collected with questionnaires among...”

R: Thank you for the comments. This question has been revised according to your suggestion.
2. p.2 line48 "There is a large gap compared to that in the US and Australia, which had established the mandatory standards of NTP ratios”. It is not completely true. In the USA mandated NTP ratios are implemented in California; in Australia, legislation has been introduced in Victoria and recently in Queensland.

R: Thank you for the comments. This question has been revised according to your suggestion. We have adjusted the order and presentation of the content in this paper, California and Victoria have been described as regions carried out mandatory NTP ratio early. As "Some regions have even passed legislation to set the maximum number of patients per nurse to improve the quality of care. In 1999, California was the first state in the USA to pass legislation setting the minimum NTP ratio to improve patient outcomes and safety. The A.B. 394 signed into law specifies the minimum NTP ratio of some clinical departments, such as intensive care units (ICUs) (1:2), maternal and infant rooms (prenatal: 1:2, postnatal: 1:4). As of 2013, 14 US states and Washington D.C. had set a minimum NTP ratio. In 2001, Victoria, Australia passed legislation to set a minimum NTP ratio, which requires a 1:4 ratio in some major hospitals and surgical wards. To enable flexible staffing based on patient conditions and care unit workload, the government of Victoria revised the original minimum NTP ratio (1:4) to 5:20.”

3. p.6 not clear what class A tertiary (level 3) hospitals are and what they do and how they compare with other types of hospitals. How many of these hospitals are there in China? Why only these hospitals were included in the study and not the other hospitals?

R: Thank you for the comment. To reduce ambiguity, we have changed the description of the class A tertiary (level 3) hospitals, and use the word “ tertiary A hospitals”.

Tertiary A hospitals are the highest level in the rating system of hospitals in mainland China. The tertiary hospital has a series of accreditation criteria (including more than 501 beds), which are graded on the hospital's medical service and management, medical quality and safety, technical level and efficiency. The implementation of 1000 points system, 900 points above as grade a tertiary A hospital. The tertiary A hospital represents the highest level and scale of medical care in mainland China.

Our data comes from a national survey conducted by National Centre for Care Quality Control. In 2017, there were 1331 tertiary A hospitals in mainland China. The National Centre for Care Quality Control conducted a survey of tertiary A hospitals across the country, resulting in 671 hospitals to cooperate with the survey. Finally, 668 hospitals (20,375 departments) met the study criteria.
4. p7 What are responsible nurses? Is it the same as registered nurses? What other types of nurses are there in China? What about their numbers? Why only these responsible nurses in the study and not other types?

R: Thank you for the comments. The responsible nurse in this paper refers to fully qualified professional nurses, who is directly responsible for the care of patients and who meets the relevant qualifications. Does not include nursing assistant and nurses involved in administration who do not directly care for patients. For the sake of understanding, the responsible nurse has been replaced by a registered nurse in the paper.

5. p7 What are: treating/dispensing nurses, lead nurses? p10 table 2: give also p-value and not only chi-square value, formulate legend repeating that the test is a Kruskal-Wallis test.

R: Thank you very much for your comments. This question has been revised according to your suggestion in the paper.

Reviewer 2 Comments for Author


R: Thank you for your suggestions. This question has been revised according to the comment. We have adjusted the order and presentation of the content in this paper, California and Victoria have been described as regions carried out mandatory NTP ratio early. As “Some regions have even passed legislation to set the maximum number of patients per nurse to improve the quality of care. In 1999, California was the first state in the USA to pass legislation setting the minimum NTP ratio to improve patient outcomes and safety. The A.B. 394 signed into law specifies the minimum NTP ratio of some clinical departments, such as intensive care units (ICUs) (1:2), maternal and infant rooms (prenatal: 1:2, postnatal: 1:4). As of 2013, 14 US states and Washington D.C. had set a minimum NTP ratio. In 2001, Victoria, Australia passed legislation to set a minimum NTP ratio, which requires a 1:4 ratio in some major hospitals and surgical wards. To enable flexible staffing based on patient conditions and care unit workload, the government of Victoria revised the original minimum NTP ratio (1:4) to 5:20.”
2. The Methods section (p5 L53) is quite inadequate for replication of this study. The study is clearly quantitative in nature however statistical analysis is limited to raw numbers, percentages and ratios with a comparison from some other countries in Asia and beyond. Appropriate statistical approaches for validly and reliably comparing the results within the sample and with other countries is not articulated nor implemented and therefore the results are not able to interpreted. This paper should not be published in its current form.

R: Thank you for the comments. According to your valuable suggestions, we re-adjusted the expression, reduced the contents of direct comparison among countries to avoid the controversy of comparability, then add more discussion about the phenomenon of inadequate nurse staffing at nighttime.

3. Comparison data with other countries (p.7 Line 9 onward) is not valid as there is no known method for data collection from the compared countries. This is problematic relating to the accuracy of the comparison because there may be different categories of staff calculated within the ratio that are not included in the sample or are included in the sample and not in the country being compared. The authors must address this in their discussion.

R: Thank you very much for your comments. According to your valuable suggestions, we adjusted the expression in the paper, reduced the contents of direct comparison to avoid the controversy of comparability, then add more discussion about the phenomenon of inadequate nurse staffing at nighttime.

4. Results (p8 L39) As previously mentioned, the researcher have not used a battery of statistical tests to determine if the null hypothesis is accepted or rejected. In fact the null hypothesis has not been stated in order to make that assessment. There should be some test and discussion on sample reliability (e.g. Cronbach's Alpha), and depending on the whether or not the data distribution is normal requiring parametric tests or bi or multi-modal, requiring non-parametric tests and which ones were used in order to demonstrate validity and reliability of the results.

R: Thank you very much for your comments. Based on previous studies, we hypothesized that there may be a shortage of nurse staffing at nighttime in China. As “These findings implied that fewer nurses were available and the nurses were less focused at night, However, at the national level, nighttime NTP ratio has not been reported in China.” Our study used the second-hand data from the survey conducted by National Centre for Care Quality Control.
We have added the Kolmogorov-Smirnov test to test, find that the data of nurses, patients and beds did not conform to the normal distribution. Therefore, the NTP ratio across different departments was expressed as median, upper and lower quartiles; the Kruskal-Wallis test was performed to compare the NTP ratio among the different regions and departments. The Pearson chi2 test was performed to compare the NTP ratio during the daytime and nighttime.

5. Tables throughout are unclear as to what is being reported on and all need to be revised and commented on in the results section.

R: Thank you very much for your comments. Based on your suggestion, we've changed the content and description in results section.

6. References are required for the sources of international comparison data.

R: Thank you very much for your comments. We have reduced the contents of direct comparison among countries.

Reviewer 3 Comments for Author

1. Abstract: Better not to use abbreviations on the abstract. Grammar and spelling shall be checked: For instance, "date" instead of data. I understand this is a secondary data, I expect on using review or data extraction checklist instead of questionnaire.

R: Thank you very much for your comments. This question has been revised according to your suggestion.

2. Better to write the full term of Nurse-to-patient ratio instead of abbreviation as key word.

R: Thank you very much for your comments. This question has been revised according to your suggestion. We has replaced “NTP ratio” with “Nurse-to-patient ratio” as key word.
3. Introduction: Better to add more information about what class A hospitals are.

R: Thank you for this comment. According to your valuable suggestions, we have added some information about tertiary A hospital in the “Setting and sample” section. As “Data analyzed in this study were collected from tertiary A hospitals. The ranking of hospitals is determined by the National Health Commission, as tertiary A designation is granted to hospitals that rank “excellent” on several measures of hospital like infrastructure, staffing, size, and clinical capacity. Tertiary B designations are given to hospitals that rank “good” on these measures. Not only does tertiary A hospital have the highest level of medical technology in China, it is also a major provider of critical care, as patients treated generally have more complex conditions.”

4. Method: Line 14: On the setting and sample section consent from hospitals is obtained. It is good how this consent is obtained? By whom and from whom? This may imply the need of ethics approval.

R: Thank you very much for your comments. Our study used the second-hand data from the survey conducted by National Centre for Care Quality Control.

For this cross-sectional study we analyzed data from National Centre for Nursing Care Quality Control, which conducted a nationally representative survey of the mainland Chinese nurse staffing. The survey was conducted in 2017, 671 hospitals of the 1,331 eligible hospitals throughout China were assigned as potential study participants. Finally, 20,375 departments from 668 hospitals in 31 provincial-level administrative regions (excluding Hong Kong, Macao, and Taiwan) in the eastern, central, and western regions of China met the inclusion criteria.

The approach taken to accessing and utilizing the hospital data was analogous to the National Health Service in England’s system for allowing researchers to hospital episodes statistics (HESonline). The data was released following a formal request to the National Centre for Nursing Care Quality Control which assessed the risk and sensitivity of the request following normal internal procedures.

5. Line 17: Better to describe …. Inclusion criteria instead of study criteria. For the information from line 17 -34, good to include reference.

R: Thank you very much for your comments. This question has been revised according to your suggestion. As “Finally, 20,375 departments from 668 hospitals in 31 provincial-level administrative regions (excluding Hong Kong, Macao, and Taiwan) in the eastern, central, and western regions of China met the inclusion criteria”
6. Line 36: It is necessary to justify why only one day data was taken.

R: Thank you for this comment. Our study used the second-hand data from the survey conducted by National Centre for Care Quality Control. This survey collected time-point data, mainly to observe the overall situation of nurse staffing in China. And I've added the explanation to “Limitation”.

7. Page 7 Line 12: Better to write as type of hospital and type of ward instead of ward name and hospital name.

R: Thank you for this comment. This question has been revised according to your suggestion. As “For this study the following data were used: type of hospital, hospital location (city and province), type of ward, number of beds in the daytime and nighttime, number of inpatients in the department, and number of nurses in the department.”

8. Line 22: better to elaborate the nurses at each hospital who were assigned to collect data got appropriate training on how to collect the data.

Thank you for this comment. Our study used the second-hand data from the survey conducted by National Centre for Care Quality Control. Information was collected by interview by trained staff. National Centre for Nursing Care Quality Control conducted the survey on August 28, 2017, at 10:00 am and 10:00 pm.

The approach taken to accessing and utilizing the hospital data was analogous to the National Health Service in England's system for allowing researchers to hospital episodes statistics (HESonline). The data was released following a formal request to the National Centre for Nursing Care Quality Control which assessed the risk and sensitivity of the request following normal internal procedures.

9. Page 8 Line 24: It is important to elaborate what components of the study was approved. Is that equivalent with ethical approval. Ethics approval might be needed to approach the hospitals and collect data about the hospitals and the units including the number of nurse.

R: Thank you very much for your comments. The approach taken to accessing and utilizing the hospital data was analogous to the National Health Service in England's system for allowing researchers to hospital episodes statistics (HESonline). The data was released following a formal request to the National Centre for Nursing Care Quality Control which assessed the risk and sensitivity of the request following normal internal procedures.

R: Thank you for this comment. This question has been revised according to your suggestion.

11. Page 10 Line 12: Table 2, the nurse-to-patient ratio is not put as ratio.

R: Thank you for this comment. This question has been revised according to your suggestion. We have replaced the ratio with index as “Patient to nurse”, which is the reciprocal of nurse-to-patient ratio.

12. Line 58: Table 3, similar comment as above. Additional table that contains bot the daytime and nighttime NTP ratio and if it is significantly differ. Otherwise based on the presented data, it is difficult to conclude either the presence or absence of significant relationship.

R: Thank you for this comment. We have replaced the ratio with index as “Patient/Nurse” in Table 3. In order to find the relationship of daytime and nighttime NTP ratio, we have added the Table 4 to test the significant difference.

13. Page 14 Line: 53 the conclusion should only base on the result form this study. It may not be possible to conclude about recommended standards or no incentive mechanism for hospitals.

R: Thank you for this comment. According to your valuable suggestions, we have deleted some points of view in the conclusion.

14. General: How can be generalized nurses shift as daytime and nighttime only. I think such classification did not consider the three-shift system. It is important to clarify this point.

R: Thank you for this comment. Our study used the second-hand data from the survey conducted by National Centre for Care Quality Control. This survey collected time-point data, mainly to observe the overall situation of nurse staffing in China. And I've added the explanation to “Limitation”. 
“This study has some limitations. Due to the lack of individual patient data, we are unable to analyze the influence of patient type on nurse staffing. Furthermore, because of the data recourse, constraints, we had to use the data from two time points on the specific day to represent nurse staffing levels during the daytime and nighttime instead of three shifts on several days of the year.”

Reviewer 4 Comments for Author

1. There are numerous grammatical errors throughout the paper.

R: Thank you for this comment. This question has been revised according to your suggestion.

2. Background: It's hard to follow your thoughts when reading the background part. The reason why you concern NTP ratio was not clear. You should also tell the readers why you chose class A tertiary hospitals and why you want to explore the differences in the NTP ratios among different apartments and regions.

R: Thank you for this comment. We have changed the background section, this section we describe the significance of NTP ratio as an index of nurse staffing, and state the situation of few research focus on nurse staffing at night, at the national level, nighttime NTP ratio has not been reported in China.

The reason why we choose tertiary A hospital is that tertiary A hospital have the highest level of medical technology in China, and is the major provider of critical care, as patients treated generally have more complex conditions. In China, there are differences in development among the eastern, central and western regions. The regional factor may have an impact on the results, so as department. We described the reasons in “Setting and sample” and “Variables” sections.

3. NTP and patient-to-nurse ratio altered arbitrarily in your paper. Select one and keep consistent.

R: Thank you for this comment. This question has been revised according to your suggestion.
4. Pay attention to use reference 16, I think it is hard to draw the conclusion that you mentioned in your paper.

R: Thank you very much for your comments. Lyvonne et al conducted a prospective study of paediatric ICUs and found that 68% (13/19) of adverse care events related to postoperative tracheal aspiration occurred at night. This reference used in this paper aim to reflect the phenomenon that there are more adverse events occurred at night.

5. Some points had nothing to do with your topic. For example, the different distribution of adverse events on weekdays versus weekends.

R: Thank you for this comment. According to your valuable suggestions, we have deleted some points may have nothing to do with our topic.

6. Method: The procedure of data collection was not clearly stated. Did you mean that all of the data was collected on August 28, 2017, at 10 am and 10 pm? Then how did you make it? Why did you choose the time points as 10 am and 10 pm?

R: Thank you for your suggestions. According to your valuable suggestions, we re-adjusted the expression, reduced the contents of direct comparison among countries to avoid the controversy of comparability, then add more discussion about the phenomenon of inadequate nurse staffing at nighttime.

7. Results: You’d better not repeat the results in text, especially the data that were showed in the tables. Summarize the characteristics of the findings instead.

R: Thank you for this comment. This question has been revised according to your suggestion.

8. Discussion: When you compare the NTP among different countries, you should make sure that the same method are used to measure NTP in these countries, in other words, make sure that the ratios are comparable.

R: Thank you very much for your comments. According to your valuable suggestions, we adjusted the expression in the paper, reduced the contents of direct comparison to avoid the controversy of comparability, then add more discussion about the phenomenon of inadequate nurse staffing at night.
9. Reference 6 (Year 2005) and 7 (Year 2007) are too old to be used in comparison. Due to the revision of the content, the position of the references are changed. We have changed the reference [9], and hope to use [10] (Year 2007).


[10] This reference is a classic article on the Victorian nurse-patient ratio model, which we hope to use in the paper.

10. Some opinions were inappropriate, even unwarranted and misleading according to the results of this study. For example, page 12, line 51-56, how did this study show that "even regions with more nurses would not have … during the daytime versus nighttime?" Besides, I don't think the four reasons you presented on page 13, line 28-54 are possible reasons for the absence of mandatory nighttime NTP ratios in Chinese hospitals, especially the fourth point. Also, I did not agree with your opinion that "the growing number of inpatients in recent years may indicate that some hospital admissions are medically unnecessary and thus waste health care resources and cause additional pressure on nurses" (page 14, line 9-17).

R: Thank you very much for your comments. This question has been revised according to your suggestion, we have revised the content of “Discussion” section.

11. Page 14, line 24, "professional satisfaction" was not mentioned before, and it's inappropriate to put forward new variable in discussion part.

R: Thank you for this comment. This question has been revised according to your suggestion.

12. The first limitation was inappropriate because "determining contributing factors to the NTP ratio" was neither your study aim nor study content.

R: Thank you for this comment. This question has been revised according to your suggestion.

13. Your conclusion seems to digress from the topic of your study.

R: Thank you for this comment. This question has been revised according to your suggestion.
“In general, large general hospitals in large general hospitals of China, the nighttime NTP ratio is significantly lower than that in daytime, and the same results were found in different regions and departments, which may bring safety hazards to patients. The phenomenon of low nighttime NTP ratio in large general hospitals may be related to the current metrics in mainland China, which cannot effectively evaluate the workload of nurses. The quality of care at night plays an important role in patient safety. In the future, we will investigate how to refine existing metrics to reduce blind spots and will propose recommendations and provide suggestions and support for improving the metrics on a national level.”

Minor issues:

1. Page 2, line 9: You should tell the full name of NTP when you mention NTP for the first time, that is you should express as "nurse-to-patient (NTP)".

R: Thank you for this comment. This question has been revised according to your suggestion.

2. Page 2, line 11-12: End the sentence with a period instead of a comma.

R: Thank you for this comment. This question has been revised according to your suggestion.

3. Page 2, line 16-17: aim----aims. Pay attention to the third-person singular form.

R: Thank you for this comment. This question has been revised according to your suggestion.


R: Thank you for this comment. This question has been revised according to your suggestion.

5. Page 2, line 24: "Date" or "Data"?

R: Thank you for this comment. This question has been revised according to your suggestion.
6. Check if you made mistakes on following points: Page 3, line 52-53, "The AB 394 Act"; Page 4, line 11-12, "(1:4) to 5-20"; Page 4, line 36, "maximum" or "minimum"? (since you said NTP as 1:8 was a minimum ratio on Page 12, line 21-22); Page 4, line 48-49, "patient-to-patient" or "nurse-to-patient"?

R: Thank you for this comment. This question has been revised according to your suggestion.

7. What does it mean by "operating beds" and "treating/ dispensing nurse"? What's the difference between "lead nurse" and "head nurse"?

R: Thank you for this comment. The actual number of beds used by patients at the time of the survey was referred to as the operating beds, which had been replaced with bed to avoid ambiguity in this paper. The treating nurse is mainly responsible for assisting the head nurse and registered nurse to carry out the nursing work, and the dispensing nurse is mainly in the dispensing room to assist the dispensing and to check the information. Because these two kinds of nurses seldom have direct contact with patients, they are not included in the calculation of nurse to patient ratio.

Head nurses are mainly responsible for document processing, reception and Organization of meetings in the office, mainly mental work, rarely nursing patients. Head nurse is a nurse's manager in department, mainly engaged in the management and the coordinated work, include the nurse staffing and the supervision. The head nurse is under the supervision of the head nurse.

8. A lot of necessary references were absence throughout the paper.

R: Thank you for this comment. We have added some important references in this paper.

9. The keywords should be medical subject headings (MeSH) that could be searched in MEDLINE.

We have replaced the keywords with “Nurse-to-patient ratio; Nurse staffing; Night care; Nursing”