Reviewer's report

Title: Association between registered nurse staffing levels and in-hospital mortality in craniotomy patients using Korean National Health Insurance data

Version: 1 Date: 08 Mar 2020

Reviewer: Fiona Nolan

Reviewer's report:

The authors have responded clearly to most comments from the previous reviews and the paper is much improved as a result.

However, they do not appear to have fully understood the comment from reviewer 1 in relation to the difference between reported staffing levels and actual staffing (head count per day). A hospital staffing level is the desirable level, and perhaps their average per year. The actual daily staffing is different. For example a hospital may meet their registered nurse staffing target most of the time, but not all- the authors have not taken into account variation in mortality which may occur due to daily, weekly or monthly fluctuations in staffing. Averages per year may not report these fluctuations. The overall staff and overall mortality are therefore reported. The authors should comment on this in the discussion section, and as point for future exploration.

Also, this second submission continues to lack clarity that registered nurses are the focus of the study, not nursing assistants. The wording 'nurse staffing' is used in the text eighty eight (88) times before the statement on Page 18, Line 56 'In this study, only the number of registered nurses, not nursing assistants, was analysed'.

As an essential correction the title should be revised so as not to mislead readers from the start. Please change to 'Effects of registered nurse staffing levels…'

Please also move the statement from Page 18 to the end of the background section, prior to the aims section.

Please replace all 'nurse staffing' wording with 'registered nurse staffing. The first use of the wording should be 'Registered Nurse (RN) staffing with all references to this phrase to subsequently read RN staffing.

Further comments on the text:
Abstract: Line 47- The intensive care of patients requires sufficient staff of all professions, not just nursing. The wording 'craniotomy patient need intensive care after surgery, requiring sufficient nursing staff' should be changed. I would suggest '…care after surgery, the majority of which is provided by registered nursing staff'.

Page 2
Line 47: The text 'When a hospital has a lower level of nurse staffing than the demands for nursing' is somewhat clumsy and would benefit from refining. It would also be appropriate to place the statement in the context of patient safety being compromised when the provision of care from both medical staff and registered nursing staff is below the level of need. If
registered nursing staff is thought to have a greater, or equal, impact on patient safety than medical staffing, this should be highlighted, with references, or placed in the context of the authors own beliefs.

Page 3
Lines 33-42- Please delete as these appear to repeat the information in the preceding paragraph.

Page 4
Line 10: Delete 'the' before patient mortality rate.

Page 5
Lines-28-29: Insert 'in which' before ICU nurses, and delete 'in caring for craniotomy patients'.
Line 48: insert 'can' before 'now play'.

Page 6
Suggest changing the heading 'purpose' with 'Aim'
The wording 'present' before 'study is not needed. I would suggest rephrasing to 'the aim of this study was to investigate…mortality, controlling for patient and hospital characteristics using Korean National Health Insurance data'.
Line 39: delete 'conducted' as this is superfluous
Please clarify whether the national data set covered all hospitals in the country.

Page 11
Please indicate what proportion of the total hospitals in Korea was represented by the 203 included in the study.

Numbers of actual registered nurses per shift and morality per shift. It would be useful to indicates whether collation of daily actual staffing nurses is possible in Korea through a central data repository.

Please also include the following as limitations of the study and factors to explore in future research in this area: lack of data around available medical staff and nursing assistant staff per day or per year (and in what way); competency assessments and training provision for registered nurses working in specialist areas or with patients with high levels of need, such as in this study
Are the methods appropriate and well described?  
If not, please specify what is required in your comments to the authors.

Yes

Does the work include the necessary controls?  
If not, please specify which controls are required in your comments to the authors.

Yes

Are the conclusions drawn adequately supported by the data shown?  
If not, please explain in your comments to the authors.

Yes

Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?  
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I recommend additional statistical review

Quality of written English  
Please indicate the quality of language in the manuscript:

Acceptable

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