Author’s response to reviews

Title: Readmission rates of South Korean psychiatric inpatients by psychiatrist workload

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Readmission rates of South Korean psychiatric inpatients by inpatient volume per psychiatrist

Response to Reviewer #2’s Comments

Minor Comments: 1. Study population: This is still not clear. At the beginning of the paragraph the authors state that the study included data from 156 hospitals but a few sentences later they say that they used data from 53 hospitals to analyse readmission rates.
Response: We apologize for your confusion about the study population. Therefore, we revised the study population section in the manuscript. In addition, to assist the interpretation of readers, we added figure 1 about the selection of study population as follows.

![Diagram showing the selection of study population](image)

Minor Comments: 2. Results – last line page 11 – the definition of the workload quartiles was already mentioned on page 8 and does not need to be repeated.
Response: Thank you for your comment. Regarding your comment, we deleted such repetition.

Minor Comments: 3. Page 18 – lines 9-10 – this was copied from the reply letter but should not be included in the main body of the manuscript.
Response: First, we apologize for your confusion due to the unnecessary sentence. Regarding your comment, we revised that sentence in the discussion section.

Response to Reviewer #3’s Comments

Major Comments: 1. Page 5, paragraph 2: This is still confusing. First, I recommend stating from the outset and repeatedly that you are talking about hospital-level patient volume. It took me a while to understand what you meant by volume. Second, it would be helpful to state from the outset that there are two potential effects of high volume – skill development and burnout (rather than waiting until page 3). This makes it easier to see how the prior work is relevant within this conceptual framework.

Response: Thank you for your helpful comment. Considering your comment, we decided to change the terms workload as patient volume per psychiatrist to reduce the reader’s confusion. In addition, we revised the introduction section based on your recommendation.

Major Comments: 2. As currently stated, the review of prior work is confusing. Lines 13-14 indicate that patient volume is negatively associated with psychiatric readmission risk, but in line 16-17, it states that “they did not assess psychiatric care.” Be clear what we know about surgical volume and what we know about psychiatric volume, and how this study fits in.

Response: Regarding your comment, we revised the introduction section in the manuscript to enhance clarity.

Major Comments: 3. A clear conceptual rationale is needed as to why individuals are readmitted to psychiatric facilities and why burnout would affect this process.

Response: Thank you for your helpful comment. We already mentioned the relationship between readmission and increasing psychiatric patient volume in the introduction section. The characteristics of medical treatment in mental health services are different from other
specialties. Given that psychiatrist treatment largely involves patient interview sessions rather than surgical procedures, such treatments would land psychiatrist with more psychological burden than other medical personnel. Consequently, the reduction in the quality of care for psychiatric disorder can be caused by such association. Hence readmission, a healthcare quality indicator, can increase because patients are unable to receive appropriate treatment due to a reduction in the quality of care.

**Major Comments:** 4. Workload measurement. It isn’t clear what article you reference for the LOS-based workload measure. Please add to page 8, Line 14.

**Response:** As your comment, we changed the term “workload” into “patient volume per psychiatrist”. Therefore, we revised the overall manuscript, and added references about patient volume per medical personnel instead of workload.


**Major Comments:** 5. Page 8, lines 14-15: What is your conceptual rationale for why there should be substantial differences in risk of readmission by workload? Also, please clearly discuss your evaluation of this assumption based on the results.

**Response:** Thank you for your comment. In this study, we categorized the inpatient volume per psychiatrist into quartiles because we thought that volume-outcome relationship in the optimal volume level of not reducing quality of care might be positive. Therefore, we expected that risk of readmission to show a U shape curve by inpatient volume per psychiatrist. However, there were linear relationships between volume and risk readmission instead of the U shape relation. Regarding your comment, we revised method section and added some discussion based on results.
Major Comments: Methods; 6. Lines 6-7: I am not sure why you used propensity score matching methods 1:3, or why that means that you can only use 156 hospitals. Was this a convenience sample?

Response: Thank you for your comment. There are about 1,730 hospitals including 39 public hospitals during 2010-2013 in South Korea. We considered that this might cause baseline imbalances due to differences in hospital characteristics because the number of public hospitals was only about 2.3% among total hospitals in South Korea. Therefore, the data used in this study only included 156 hospitals (117 private vs 39 public) that were extracted using the propensity score matching-methods (1:3), conducted based on the nearest neighbor methods while adjusting for hospital characteristics including hospital location, nursing staffing level, number of total beds, number of intensive care unit beds, number of emergency room beds, and number of doctors [18]. Among 156 hospitals, we only analyzed hospitalization cases of the five most frequent diagnostic categories among overall psychiatric disorder that classified diagnoses according to International Classification of Diseases groupings (ICD-10: F0.x-F4.x) to reflect specific clinical mechanisms as follows: “organic, including symptomatic, mental disorders (F0.x)”, “mental and behavioral disorders due to psychoactive substance use (F1.x)”, “schizophrenia, schizotypal, and delusional disorders (F2.x)”, “mood disorders (F3.x)”, and “neurotic, stress-related and somatoform disorders (F4.x)”. Therefore, we excluded the 103 hospitals without hospitalization cases for the major five psychiatric disorders. Then, we excluded 3,014 cases with missing values for the variables of interest. Finally, we used NHI claim data from 53 hospitals to analyze readmission rates of psychiatric inpatients within 30 days of discharge. These data were collected between 2010 and 2013 and included 37,796 hospitalizations in 53 hospitals. The unit of analysis was hospitalization rather than patient. Considering your comment, we revised the description about the study population in the manuscript and added related references as follows.


Response: We apologize for your confusion related to the study population. Therefore, we revised the study population section in the manuscript. In addition, to assist the interpretation of readers, we added figure 1 about the selection of the study population.

Major Comments: 9. Page 16, line 8: What is the basis for the recommendation of optimal patient volume?
Response: In this study, there was an association between inpatient volume per psychiatrist and readmission, instead of a volume-outcome relationship in any level. These results suggest that lowest inpatient volume per psychiatrist (Q1 in this study) had the best quality of care compared to other groups. Therefore, although further detailed studies considering the workload of each psychiatrist is needed, we recommended that each psychiatrist needs to provide treatment in less than 1282.0 days for 1 year based on this study. To assist the interpretation of readers, we revised this sentence.

Minor Comments: 10. Table 1 is unclear. Does Yes = readmission?
Response: Thank you for your helpful comment. Considering your comment, we revised table 1.

Minor Comments: 11. Page 18, lines 7-10: Appears to be copied from the letter. Please reword to make more sense to readers.
Response: First, we apologize for your confusion due to the unnecessary sentence. Regarding your comment, we revised that sentence in the discussion section.
Minor Comments: 12. Grammar: Page 15, line 2: lacks (lack) of statistical power
Response: Thank you for your comment. We revised that sentence considering your comment.

Minor Comments: 13. Grammar: Page 18, line 6: inpatients was (were) hospitalized
Response: Regarding your comment, we revised that sentence in the discussion section.

Minor Comments: 14. It might be clearer to refer to your variable as patient volume rather than workload – or at least choose one or the other and use that term throughout the paper. At first, I thought that you were measuring both.
Response: Thank you for your helpful comment. Regarding your comment, we decided to change the term “workload” to “patient volume per psychiatrist”. Therefore, we revised the title and the manuscript overall.