Author's response to reviews

Title: Institution specific risk factors for 30 day readmission at a community hospital: a retrospective observational study

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Author's response to reviews: see over
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Dr. Roy L. Soiza  
Editor, *BMC Health Services Research*  
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Regarding manuscript 1086738065101508 revisions

Dear Dr. Soiza:

We thank you for your invitation to re-submit our work. We are re-submitting for your consideration manuscript 1086738065101508, an original research manuscript entitled “Institution specific risk factors for 30 day readmission at a community hospital.” The reviewers offered many suggestions and we appreciate their thoughtful comments. We have addressed the reviewers concerns wherever possible while aiming to maintain the purpose of the study. Attached to this cover letter is a memo with a point by point response to the reviewers’ comments.

We thank you for your invitation and hope that our revisions are acceptable for publication in *BMC Health Services Research*

Sincerely,

Lee Park, MD MPH
Reviewer Comments and Author Responses
Manuscript 1086738065101508

Referee 1:

In general the work would be improved if the authors followed the STROBE guidance for reporting observational studies.
- Where possible, we have attempted to incorporate the STROBE recommendations.

Avoid abbreviations (eg CMS) in abstract
- All abbreviations in the abstract, including CMS, have been spelled out.

For an international journal, the opening sentences should be qualified by health care setting, ie United States
- We have added the setting in the opening sentences, Introduction, paragraph 1.

Abstract results require more data, how many were included in the analysis?
- We have added more data into the abstract.

What is the meaning of “borderline significance” and how does it differ from “not associated”?
- Statistically, there is no difference from “borderline significant” and “not associated” when strictly taking into account the p-value cutoff of 0.05. However, after adjusting for known risk factors associated with readmission, there was only one variable where the p-value was between 0.05 and 0.10. We do think this is an interesting finding to review. We have changed the wording to “trend toward significance” when we discuss this finding. We have clarified that a trend towards significance was a p value between 0.05 and 0.10.

Methods. For an international journal, the authors should define terms such as “community hospital” and “housestaff”.
- We have defined those terms, Methods, paragraph 1

The method and purpose of the “survey of 20 hospitalists” is not described.
- We have clarified that the method was an email questionnaire, see Methods, sections titled “Survey of hospitalists” and “Preliminary data.”
- We have included the purpose of the survey, see Methods, section titled “Survey of hospitalists,” sentence “The goal of our survey…”

Can the authors provide data to validate the case finding strategy? The mechanism described will miss those discharges readmitted to another hospital in the area. The method does not account for mortality between discharge and 30 days and those with early death may be included in the “no readmission” group but cant really be considered to have a “good” outcome.
- We appreciate the reviewers thoughtful comment related to data limitations. We acknowledge that the case finding strategy will miss readmissions to another hospital. We also acknowledge that we cannot account for mortality between discharge and 30 days. We have added a sentence reflecting this limitation to our Discussion, paragraph 5 (“This study does have limitations…”). However, our readmission rates were similar to those rates in other single institution studies (see references 10 and 21, Discussion, paragraph 5).

Length of stay is problematic as an outcome variable as it will be biased by early mortality. How were the variables included in the analysis chosen? Ideally these should be based on existing readmissions tools
and consensus agreement; from the manuscript it seems the authors studied those variables where data were available from administrative databases.

- The variables that were included in the base regression model were those that have been shown to have been associated with readmissions based on previous studies (see references 8-13, clarified in the Introduction, paragraph 2).
- We purposefully used the administrative data to make sure that those variables that have been most associated with readmission in previous literature were included in this study.

The authors do not describe proportion of variables with missing data and how missing data were accounted for in the statistical analyses.
- Please see Methods, section titled “Retrospective observational study”

Results. As a style issue, sentences should not begin with numericals eg “71.3 had Medicare…."
- We have changed this in the body of the article.

The author should be consistent in the presentation of numerical data; ideally 95 percent confidence intervals should be used rather than “p” values.
- We agree that consistency is ideal when presenting data. We have followed the standard convention of including the 95% CI for all odds ratios. For unadjusted data, when describing differences in rates, we have followed the standard convention of presenting the p-value.

Discussion. The first paragraph is a repetition of the data presented in the results section and is redundant.
- This paragraph has been deleted.

The analysis of “hospital factors” as a predictor of readmission is interesting but certain factors such as “floor of admission” are only relevant to the institution studied. I would have preferred analysis of variables with greater generalizability.
- Because this study was looking at institutional risk factors, it inherently will be less generalizable. However, given that we were looking for specific factors related to the structure and processes at Newton-Wellesley Hospital, including other institutions would have decreased the findings of the study as each institution has different structures and processes. We have clarified in both the title and in the background that we are aiming to examining institution specific factors.

Table 1: For variables with only two categories eg male / female there is no need to give data on both – this only adds to an already busy table.
- Table has been changed accordingly.

Referee 2:
Major Compulsory Revisions
Study goals: The first study goal to replicate previously studied predictors in this setting is not novel and the small size of the study precludes making any important inferences of previous predictors are or are not replicated.....
- This goal has been taken out of the paper.

There are several process of care factors relating to work load – number of patients, hours, time required to learn about patients on switch day that -- that could be studied as factors that might increase risk of 30-day readmission: community hospital organization of clinical services, hospital census, hospital physician (patient) census, hospital physician work hours, patient discharge on hospitalist physician switch day or house staff switch day or even other weekday/weekend factors. These factors are generally
not available studies with large sample size and so the investigators study of these factors would be of interest.

See below

Analytic approach: A parsimonious prediction model that could be used as a clinical or health services prediction rule to identify patients with a high risk of readmission that should be managed differently from patient with a low risk of readmission should be validated (replicated in the same setting and other settings) and its performance evaluated overall to see if it discriminates between patients actually readmitted and not readmitted and if it is well calibrated in its estimates of the probability of readmission. This is clearly beyond the intent and scope of the current study. An alternate approach in the analysis would test all the hospital physician and community hospital factors of interest mentioned above to see if they predict 30-day readmission after adjusting for known factors and potential confounding factors. In this analysis season may be a marker of confounding reflecting may unmeasured patient, physician, hospital and extraneous factors. Thus the analytic method should more carefully follow the study goal. Since the study sample is small, the emphasis should be on estimation – the independent odds ratios and their 95% confidence intervals – for the (novel) important variables that are hypothesized to increase risk of 30-day readmission rather than a search for a parsimonious model with significant predictors. The stratified models focusing on the three overlapping disease cohorts provide little additional information and should be dropped from the analysis.

Please see Methods, section labeled “Analysis” as analysis was adjusted to focus on the process of care factors. Disposition has been added back into the base model and instead of attempting to create a prediction model we have changed the analysis as suggested above. This change in analysis did not change the results overall.

The stratified analysis was taken out of the analysis.

Discretionary Revisions

1. Consider the following:
   a. patient associated factors = patient factors (age, gender, insurance, diagnosis (heart failure, pneumonia, chronic obstructive pulmonary disease) morbidity score, admission in previous calendar year, length of stay, discharge on switch day, discharge location
   b. provider associated factors = (hospitalist) physician factors: physician patient, census, physician hours
   c. hospital associated factors = hospital factors: clinical services (medicine, medicine/oncology, cardiac/telemetry); teaching or non-teaching service; floor census
   d. other factor: season

   We have put variables into these categories as suggested with the exception of discharge on a switch day as that is a characteristic of the structure of the hospitalist and resident service for the particular hospital. We opted to put season into hospital associated factors as our thought is that the finding regarding season has something to do with the structure or process of the hospital, though we could not fully test our hypothesis (see Discussion section, paragraph 2, “It was unclear to us why the wintertime…”)

2. Carefully describe the “institution specific factors and the rationale for how they may affect 30-day readmission.

   Please see Discussion section, paragraph 1 (While patient factors certainly impact a patient’s risk of readmission, the risk may also, in part, be related to institution specific factors that impact the care of the patient during the admission. While floor was not found to be significant, it is interesting that patients who were discharged from the cardiac floor had a trend towards decreased readmission..)

   Please see Discussion section, paragraph 2 (It was unclear to us why the wintertime was associated with higher readmission rates compared to the rest of the year…)
- Please see Discussion section, paragraph 4 (Though the inclusion of hospitalist data, we were able to study provider workflow factors and had thought that workflow factors...).

3. Consider using a health services research specific conceptual model for use of health services.
   - We have specified the model that we used in the paper to adjust, see Methods, “Analysis” section.

4. Elixhauser comorbidity score: Clarify whether this is a total morbidity score (sum of Elixhauser categories with one or more discharge diagnoses or a total co-morbidity score (sum of diagnoses except for the primary discharge diagnosis).)
   - We have clarified that this is a total morbidity score.

5. Discharge location: Discharge to a facility has been found to increase risk of 30-day readmission.
   - This was included into the base model. See Methods section, Analysis.