Author's response to reviews

Title: Avoidable hospitalizations in Switzerland; A small area analysis on regional variation, density of physicians, hospital supply and rurality

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Author's response to reviews: see over
Reviewer K. Matter-Walstra

General comments

Link to international comparison
We extended the first paragraph of the discussion with comparative data from the OECD. Data of other major diseases suitable for international comparison are currently lacking in the international literature, mainly due to inconsistent classification criteria.

No information on patient selection procedure
We added several sentences to paragraphs “Design of the study” and “Data” that improve the description of the patient section procedure. It explains that we use cases instead of patients and provides the rehospitalisation rates. Additional information is provided in the appendix on the exact eligibility criteria on the basis of ICD9 and ICD10 codes for all included diseases.

Major Compulsory Revisions

Design of the Study
Page 4
See comments above, Hospitalizations were defined as avoidable based on ICD10 codes listed in the table provided in the appendix.

In hospital, mortality is considered as a quality indicator of hospital care. Hospital deaths are therefore (at least theoretically) not related to unnecessary hospital admissions. But we nevertheless agree with the reviewer that hospital admission leading to death may not be classified as avoidable. For reasons of consistency with the OECD definitions we did not exclude these cases.

Database information is not helpful to directly discriminate between AH and necessary hospitalizations. The concept of avoidable hospitalizations is based on specific diagnoses that should not be treated in hospitals. Database information allows therefore only indirect identification of avoidable hospitalizations. We incorporated more information on these subjects on page 4 and the limitations section.

Results

A flow chart would not be helpful in the setting of this study as the process of patient selection was performed in one single step based on ICD10 codes (and age).

From a hospital perspective AH represent a proportion of the total number of hospitalization (see table 2), no flow chart can be drawn in this context.

Discussion
Page 10
The literature provides only indirect support for this statement (see various atlas projects ongoing in multiple countries). We added the respective references and reformulated the first paragraph of the discussion. Based on long term research mainly performed by the Dartmouth Atlas group, two digit variations in health care utilization are always related to characteristics of the health systems rather to the health status of patient populations. However, the definition of “the right rate” is almost impossible as valid regional estimates of effective medical needs e.g. for asthma are lacking in almost all countries.

Minor Essential Revisions
Page 3
We added references documenting the use of AH as a quality indicator in various countries.

Page 12
Our data provide no information on type of physicians referring patients to a hospital. Unfortunately, no further analysis is possible in this context. A sentence documenting this problem was added to the second paragraph of the discussion.

Page 14
We agree with the reviewer about the problem of limited validity of AH as indicator of quality and appropriateness of care. (see also comments to reviewer R. Forero). Current research in our institute will provide more data on this issue in a few months.

Reviewer R. Forero

Major Compulsory Revisions

Definition of the research question
We agree with the reviewer that avoidable hospitalizations have limited validity as an indicator of quality of care in the ambulatory setting and we acknowledged this in the limitations of our study (second paragraph).

The reviewer suggests a redefinition i.e. a reversion of the research question in our paper. He suggests that the proportion of conditions that received good ambulatory care should be analyzed instead of the proportion of hospitalizations that could have been prevented by better ambulatory care. This approach would imply a complete new study with a different data source. In contrast to our current procedure, data should be collected in the ambulatory setting and a definition of good ambulatory care would be required to disentangle hospitalizations warranted by effective medical needs from unwarranted hospitalizations in this setting. Although such study would provide very valuable information on number of AH, there are currently no comprehensive data for the ambulatory sector available in Switzerland (and elsewhere), unfortunately therefore such a study cannot be performed.

AH based on main diagnoses has its limitations, however these limitations don't outweigh the practical advantages of using avoidable hospitalizations for health service planning. Therefore, the OECD and many countries included this measure into their respective frameworks of measuring health systems performance.

References documenting the use of AH in various countries were added (introduction). We also extended the description of AH as a component of the Health Care Quality Indicator Project established by the OECD.

Appropriate methods, quality of the data
The reviewer mentions major confounders of the outcome variable without specifically list such factors. Confounders in our study relate most likely to unmeasured (or immeasurable) variables that can distort the relationships between the explanatory factors of our model and the incidence of avoidable hospitalizations as the outcome variable. Such problems of confounding are inherent to studies using administrative data and cannot be resolved as the respective data are usually missing for this type of data. We were aware of these problems and decided to use mixed models with random effects for two geographic levels involved in the analysis. This approach allows some control for unmeasured factors related to
geographic characteristics but there are still limitations that we acknowledged in the first paragraph of the section “Strengths and Limitations”.

The reviewer suggests to add readmission data to the results. Readmission rates are seen as an indicator of quality of the inpatient sector and the information may not be helpful to measure the performance of the Swiss outpatient sector. We nevertheless added overall and disease specific 3-month rehospitalization rates to the characteristics of avoidable hospitalization given in table 1. We also added the average number of hospitalizations for patients that were hospitalized more than once. It is however, impossible to discriminate between rehospitalizations that are caused by poor ambulatory care and rehospitalizations that are associated to poor inpatient care.

We extended the first paragraph of the discussion with comparative data from the OECD.

**Specific comments**

Page 3
References were added

Page 5
Number of hospitalizations for patients that were hospitalized more than once were added.

Page 6
Our data provide no information that would allow a direct discrimination between AH and necessary hospitalizations. The concept of avoidable hospitalizations is based on specific diagnoses that should not be treated in hospitals. (see also comments of reviewer Matter-Walstra)