Author's response to reviews

Title: Is patient-grouping on basis of condition on admission indicative for discharge destination in geriatric stroke patients after rehabilitation in skilled nursing facilities? The results of a cluster analysis

Authors:

Bianca I Buijck (b.buijck@elg.umcn.nl)
Sytse U Zuidema (s.u.zuidema@umcg.nl)
Monica Spruit-van Eijk (m.spruit-vaneijk@elg.umcn.nl)
Debby L Gerritsen (d.gerritsen@elg.umcn.nl)
Raymond TCM Koopmans (r.koopmans@elg.umcn.nl)

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Author's response to reviews: see over
To the editorial office

BMC Health Services Research

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Dear editor,

We enclosed the revised version of the original research article ‘Poor condition on admission does not ascertain stroke rehabilitation outcome of geriatric patients’ by Bianca I. Buijck, Sytse U. Zuidema, M. Spruit- van Eijk, Debby L. Gerritsen and Raymond T.C.M. Koopmans for consideration of publication in ‘BMC Health Services Research’.

We are thankful for the useful suggestions of the reviewers. We changed the manuscript accordingly. Wherever suggested changes are not made, we motivated the reason below.

We hope that the revised version will be accepted for publication. We are looking forward to your reply and will be happy to answer any questions that might arise about this article.

Yours sincerely,

Bianca Buijck RN, MSc
Radboud University Nijmegen, Medical Centre
Department of Primary and Community Care
Centre for Family Medicine, Geriatric Care and Public Health
PO Box 9101 117 ELG
6500 HB Nijmegen, the Netherlands
e-mail: b.buijck@elg.umcn.nl
telephone: 0031-24-3655307/ 0031 6 12986373 (mobile)
fax: 0031-243541862
Author remarks to the reviewers: manuscript MS: 113283299709200

Poor condition on admission does not ascertain stroke rehabilitation outcome of geriatric patients: results of a cluster analysis

Authors: Bianca I. Buijck, Sytse U. Zuidema, M. Spruit-van Eijk, Debby L. Gerritsen and Raymond T.C.M. Koopmans

Dear editor,

We are pleased to hear that your experts have reviewed our manuscript. In the following, we provide a point by point response to the remarks and suggestions of the reviewers.

Reviewer: Abdel Douiri

Reviewer's report:

The subject matter of this paper is related to stroke care, particularly, post-stroke rehabilitation of geriatric patients. Thus, research that suggests or improves patient’s management would therefore be valuable.

The question posed by the authors is well defined and data/methods were in general well described. However, the English expressions of this paper needs some revision, particularly, it needs to look at the use of verbs. I suggest a revision by a native English speaker. Also, statistical analyses and interpretations could be improved further. Details of my review are as follows:

Major Compulsory Revisions:

1- In the abstract, result paragraph, could you please give number of patients in each cluster (dominator) before stating rates?

We inserted in the abstract the number of patients in each cluster: "n=52, n=75"

2- In background, page 3, line 6, the sentence “A quarter of all patients die after a stroke” is incomplete. Do you mean “A quarter of all patients die in the first 3 month after a stroke”? Also, it may need a reference.
We added a reference in the reference list and changed the text accordingly: “More than a quarter of all patients die after a stroke within one to three months.” (Vaartjes I, Reitsma JB, Berger-van Sijl M, Bots ML. Gender Differences in Mortality after Hospital Admission for Stroke. Cerebrovasc Dis, 2009; 28: 564-571.)

3- In page 5, paragraph Patients, The second sentence begin with “Patients who declined ….” do not read well and not clear. Could you please revisit/rewrite this senten?

We changed the text as the reviewer suggested: “Four categories of patients were excluded from participation: 1) patients who declined to give informed consent, 2) patients who were legally incapable to give informed consent, 3) patients who were expected to be discharged within 2 weeks, 4) critically ill patients.”

4- In page 5, paragraph Measurements, first sentence, do you mean “ischemic stroke” or “stroke subtype”?

We changed this as the reviewer suggested: ” (ischemic/non-ischemic)”

5- In page 6, line 12, the sentence “The use of a walking device is allowed” is not clear or something is missing and needs a revision.

We changed this in “The use of a walking device is permitted during the test.”

6- In page 7, statistical analysis, could you please give a reference to the SPSS two-step clustering method?

We added a reference in the text and a web-link in the reference list. (http://www-01.ibm.com/software/analytics/spss/)

7- In page 7, statistical analysis, have used parametric methods without testing the normality of the data?

We re-analyzed the data in collaboration with a statistician. We analyzed data by using non-parametric tests. We described this in the method - and results section.
8- In results paragraph, from the table 1 most scales are skewed “not normally distributed” as the standard deviations are too large. So means and SDs are not appropriate to describe the data. Could you please replace these by median and interquartile ranges?

We replaced mean/s.d. by median and interquartile range as the reviewer suggested.

9- Also in table 2 paired t-test is not appropriate in skewed data and Wilcoxon test should be used instead. But given the unbalance measures between groups at the admission, it would be appropriate to adjust for the baseline differences using ANCOVA to assess the changes between groups.

We re-analyzed the data in collaboration with a statistician. Two variables were not normally distributed, namely NPI and FAC. Other variables were considered to be normally distributed. We considered the option of dichotomizing the two variables which were not normally distributed, in order to perform a logistic regression analysis. Then for the other variables we considered an ANCOVA. However, we encountered several problems:

1) Also for an ANCOVA a normal distribution is warranted.
2) An assumption for an ANCOVA is randomness and independent sampling. Patients were not random assigned into the groups, but “selected“ on basis of their functioning.
3) Another assumption is homogeneity of regression slopes. Performing the ANCOVA model with interaction terms (relation between admission and discharge scores the same for all groups, then almost in all cases there is a significant interaction term). All regression equations (slopes) across the cells of the design are NOT the same.
4) The size of the groups differs, this has a negative effect on robustness of the ANCOVA.

As suggested by the reviewer, we replaced the mean and standard deviation for median and interquartile ranges. However, the comments of both the reviewers brought us to the following additional analysis. We used the Kruskall-Wallis test to test for differences between groups.
We added the following text in the methods section “The Kruskall-Wallis Test was used to test for differences between groups with reference to the changes between admission- and discharge scores.”

Furthermore, we added the following text in the results section:

“The poor cluster of which patients were discharged showed the greatest improvement in relation to the other groups. Significant differences between this group and the other groups with reference to changes between admission- and discharge scores appeared for balance (BBS), ADL (BI), walking ability (FAC), arm function (FAT) (Kruskal- Wallis Test p< 0.01) (table 2).”

10- In page 9, the last line in discussion paragraph, the wording “…higher predictive value…” is not clear, do you mean “age and disability seem to have a stronger association than …”? I believe the interpretation about these comparisons needs a multivariate analyses adjusting for any confounders. Maybe if you do adjusted analyses, you will find that the age could indeed be associated to functional outcomes as is commonly reported in the literature.

In our study, age did not appear to be a relevant variable to assign patients to one of the two clusters. That was the reason to add that sentence. We changed that sentence in order to give more clarity: “In this regard, our results were comparable to those of other studies of predictors of functional outcome. Although there is controversy in the field of stroke research regarding predictors of stroke outcome, in most studies age and disability have a stronger association with negative outcome than neuropsychiatric symptoms and depressive complaints. Interestingly, in our sample, age was not a significant factor to separate patients into the poor and good cluster.”

Studying determinants was not aim of the present study.

In other publications from the GRAMPS study we investigated the determinants of rehabilitation outcome. (i.e. Determinants of rehabilitation outcome in geriatric patients admitted to skilled nursing facilities after stroke: a Dutch multi-centre cohort study.

11- In discussion paragraph, isn’t it evident that some patients with poor outcome at the acute stage could improve in the first 3 months after stroke as part of stroke recovery which is reported in many previous studies? So acute data are not reliable as baseline data and the time between the admission to rehabilitation and date of first stroke should be reported for clarity.

Indeed, many stroke patients improve significantly in the first 3 months after stroke and we describe in the discussion that predictions about discharge can be misleading if therapists and clinicians only take initial functional status as a measure to predict discharge. However, the health professionals at the SNFs (need to) define a care-plan shortly after admission. This article is about finding which characteristics are relevant in determining groups of patients to whom a similar intensity could be offered and subsequently study how the patients in these groups improve. Before admission to the SNF, patients stayed for a mean of 23 days (range 9 days - 6 weeks) in hospital after their stroke. We added the mean hospital time in the results paragraph. In the method section we already described that we performed measurements within 3 weeks after admission to the SNF. Therefore, (spontaneous) recovery appeared probably mostly in that period.

12- In page 11, discussion paragraph, last sentence, could you please develop further, by using figures from your sample, how the cost of healthcare will decrease?

We re-phrased the sentence in: “Rehabilitation in the homes of patients or in a day-care center would not only be beneficial to patients but is also more cost-effective. Costs of outpatient rehabilitation are less than the costs of an admission to a Dutch SNF: the average costs per person per year are 95.000 euros for institutional SNF care (inclusive intensified therapies) and 5.200 euros for home care (exclusive 65 euros per hour for intensified therapies). Consequently, home-care or day-care could decrease health care costs.”
Additionally, we added two references.


13- In result/discussion paragraph, I still believe a multivariate analysis is needed to confirm the finding.

The title, background and objectives were not clear enough and we changed them hoping we have provided the necessary clarification. “Geriatric stroke patients are generally frail, have an advanced age and co-morbidity. It is yet unclear whether specific groups of patients might benefit differently from structured multidisciplinary rehabilitation programs. Therefore, the aims of our study were 1) to determine relevant patient characteristics to distinguish groups of patients based on their admission scores in skilled nursing facilities (SNFs), and (2) to study the course of these particular patient-groups in relation to their discharge destination.”

(see also point 9)

**Minor Essential Revisions:**

14- In page 4, line 13, could you please change “The aims of our study were as follows:” to “The aims of our study are as follows:” Also the rest English expressions of this paper need some revision, particularly; it needs to look at the use of verbs.

We changed the sentence. The initially submitted paper was reviewed by San Francisco editors, the revised paper was reviewed by a native English speaker. This native speaker suggested several changes. We changed the text accordingly.

15- In page 6, the repeated sentence about the BI/FAT/BBS validity in stroke research is not needed in the text. Could you please remove these 3 sentences and leave only their references.

We removed these sentences.
16- In page 7, statistical analysis, the last sentence in the first paragraph. Do you mean “Cluster analysis was used to discriminate between structures in data”?

We changed the sentence in: “To identify meaningful groups of patients, we first performed a Two-step Cluster Analysis to identify variables that discriminate between groups. Cluster analysis aims to create groups in which the degree of association between objects is maximal if they belong to the same group and minimal otherwise.”

17- The bibliography has some unusual bold font and needs to be revisited.

In our opinion the reference-list was in accordance with the guidelines.

18- In author contributions, could you please state the author who conducted the statistical analysis and the grantor of the study?

We have already stated who the statistical analysis performed and who the grantors of the study were at page 13 (authors contributions and funding). We re-analyzed the data in collaboration with a statistician and added a paragraph ‘acknowledgement’: “We thank Hans Bor, statistician, for statistical advice”.

**Reviewer: Tinne Dilles**

**Reviewer's report:**

Dear authors

With interest I have read your manuscript. It took me a while to get a clear image of the direction it was going. The title and the abstract made me expect something different of the main document than in actually is. I do believe that the paper can be improved a lot before publication and I hope my comments and advises are helpfull.

**Major Compulsory Revisions**

1) When I read the title, I did not know what to expect from the article. Why would poor condition on admission ascertain stroke rehabilitation? When I went on, reading the abstract, I was confused. Isn't it normal to have patients in good and
poor condition on admission? One of the objectives is to investigate how subgroups respond after admission, yet, respond to what? Another objective was to investigate differences between patients who were discharged to independent living situation and nursing homes (not specified), yet, differences in what? It is advisable to choose one, clear aim, and to adjust the manuscript, writing it to give an answer to that aim.

Cluster analysis, dividing the population in two groups, can be considered as a means, not a goal.

We agree with the reviewer that the title and objectives were not clear enough and changed them extensively hoping we have provided the necessary clarification. In this, cluster analysis is indeed regarded as a means to reach these objectives.

2) Background:

A) It is advisable to evaluate the relevance of certain parts of the background, when the aim is clarified. Why are the consequences for relatives important in this context? You mention rehabilitation centres and SNFs as options for geriatric stroke patients to rehabilitate. Can you tell a little bit more about the rehabilitation centres and why these centres are not part of your research? B) When reading the determinants of rehabilitation outcome after stroke, I hoped you had investigated these determinants (comorbidity, therapy intensity, ...). Do you have data on these factors to compare the impact in both groups on discharge? That would be very interesting.

A) We deleted text on consequences of stroke and focused on the organization of geriatric rehabilitation in the Netherlands.

B) In other publications from the GRAMPS study we investigated the determinants of rehabilitation outcome. (i.e. Determinants of rehabilitation outcome in geriatric patients admitted to skilled nursing facilities after stroke: a Dutch multi-centre cohort study. Spruit-van Eijk M, Zuidema SU, Buijck BI, Koopmans RT, Geurts AC.Age Ageing. 2012 Aug 10. [Epub ahead of print]).
Studying determinants was not aim of the present study. Studying the factors mentioned would indeed be very interesting. Unfortunately, we do not have robust data on these factors. We performed a pilot study into therapy intensity (physiotherapy), which suggested that patients in poor condition received less therapy than patients in good condition (submitted to a Dutch journal). Some literature on this matter was found, which we mention in the discussion paragraph. This, in our opinion, contra-dictionary finding is an important argument for further study into the influence of therapy intensity on rehabilitation outcome and discharge destination.

3) Results
In the results section, you mention a total 84 patients had been discharged to an independent/assisted-living situation and 43 to LTC. In Table 2 these data are different: for DILS: 28+60=88, for LTC: 24+15=39
The text in the manuscript is correct. The headings in the table were incorrect (mixed-up the words LTC and DILS in row 3 and 4, cluster 1). We apologize for that. We adjusted the headings.

4) Cluster analysis was performed to divide the population into groups based on their condition on admission. Why did you include the factors age and sex in the cluster analysis? Or were these factors not included in the analysis? If they were not included, please make a clear distinction in Table 1 and explain in the methods section.
Indeed, age and gender were included in the cluster analysis. The variables for the cluster analysis were determined on the basis of the literature. In literature, rehabilitation outcome is associated with age and gender. Therefore, we chose to include these in the analysis. To clarify this issue, we adjusted Table 1 and re-phrased a sentence in the methods section.

5) As a reader you need to search very hard into the results of the second table, to try to find an answer to the research questions. This can be improved by - clarifying the names of the variables and clusters in the table (for example 'walking ability' i.s.o. FAC)
We added the instruments in the text, and inserted text in the tables.
- giving the differences of difference scores. For example: calculate the % difference between admission and discharge score in cluster one and the % difference between admission and discharge score in cluster two. This makes it easier for readers to interpret. Which differences you calculate, should be adjusted to the aim. Make sure the results required to answer the research question are clearly stated.
We re-analyzed the data in collaboration with a statistician. Calculation of the percentage improvement according to the score on admission was difficult because in a lot of cases the score on admission was 0. Therefore, the difference-scores between groups cannot be calculated. However, the comments of both the reviewers brought us to the following additional analysis: We used the Kruskall-Wallis Test to test for differences between groups. We added the following text in the methods section “The Kruskall-Wallis Test was used to test for differences between groups with reference to the changes between admission- and discharge scores.”
Furthermore, we added the following text in the results section:
“The poor cluster of which patients were discharged showed the greatest improvement in relation to the other groups. Significant differences between this group and the other groups with reference to changes between admission- and discharge scores appeared for balance (BBS), ADL (BI), walking ability (FAC), arm function (FAT) (Kruskal- Wallis Test p< 0.01) (table 2).”

**Minor essential revisions**

6) details on stroke/ pathology are not demographic data
We adjusted the text in the method section.

7) ADL and functional status measured by the BI are both used. If I have understood correctly, ADL is not measured, only functional status.
According to the literature, BI measures the ADL. We adjusted the methods, results and discussion section by naming the instruments complementary to what they measure.

8) In the statistical analysis section, you mention baseline data on cognition, aphasia and swallowing. How were these data collected?
We inserted the reference of our detailed study-protocol.

9) Background section: Therefor, the purpose of rehabilitation IS not... (word IS is missing)
We added the word “is”.

10) add a separate table of the characteristics of the population
As the reviewer suggested, we added data in table 1: the total sample n=127.