Author's response to reviews

Title: Process skill rather than motor skill seems to be a predictor of costs for rehabilitation after a stroke in working age; a longitudinal study with a 1 year follow up post discharge.

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Author's response to reviews: see over
Dear Editor,

We are submitting the revised manuscript entitled “Process skill rather than motor skill seems to be a predictor of costs for rehabilitation after a stroke in working age; a longitudinal study with a 1 year follow up post discharge.”

We have tried to follow the suggestions for revisions and to clearly describe what we have changed. In the cases when we do not agree with the suggestions we have tried to answer with an explanation to the different opinion. The manuscript has been sent to a professional copyediting service. With the changes made after the suggestions of the referees we hope you will be able to decide on the manuscript.

Looking forward to hear from you,

Sincerely

Ann Björkdahl
Institution of Clinical Neuroscience, Rehabilitation Medicine

Revisions of the paper “Process skill rather than motor skill seems to be a predictor of costs for rehabilitation after a stroke in working age; a longitudinal study with a 1 year follow up post discharge.”

Referee 1

The point suggested is added in the discussion, last paragraph:

The sample consisted of patients in the Swedish health care system, referred to the rehabilitation clinic, which implies patients with a moderate to severe stroke, and costs may vary with stroke severity and health care systems.

The suggestion of Markov modelling is not doable, as we understand it, since the data are only gathered at one year. In a different design with more occasions with data gathering this would have been very interesting to perform.

Referee 2

No 1. The study as we see it, is not a pilot study per se. However, you are of course right that this is the first time where these types of analysis are presented, thereby exploring the possibilities of how to treat data. We hope that someone will do a larger study with the same approach to confirm or refute our results.

No 2. No power analysis was performed for the regression analysis in this paper. An power analysis was performed for the RCT trial (Björkdahl A et al, Clin Rehab, 2006;20:1038-1049) in order to detect differences between the two groups, which gave us information on the number of patients needed for that study. The material that we present here are the data from the whole group. In table 3, where the model ANOVA is presented the $R^2$ and the p-values indicate that the models are quite reasonable in spite of the low number of patients.
No 3. Changes are made in the method section to make it clearer. We consider this part to belong in the method section as this paper was based on an available sample of patients included in a randomized study of home rehabilitation.

No 4. As you suggested, a hypothesis is added after the aim in the introduction.

*Based on prior studies we hypothesized that ability in activities of daily life and aphasia would influence costs.*

No 5. We have tried to change the introduction of the tables according to your suggestions. Table I remained under the method section according to the comment in no 3. Table II do not appear until under results.

No 6. Average ages in previous studies have been added. Three studies in the review mentioned above reported costs by age at the time of stroke and each showed a significant trend toward lower costs with increasing age (above 65 years of age) [8-10]. However, Black-Schaffer and Winston [30] found an association between age (the young groups, <55, 55-64 and 3 older groups) and LOS, where LOS shortened with each successive age group, even though the LOS efficiency, i.e. gains in FIM points per day, had a significant relationship with younger age.

No 7 and 8. We have tried to clarify that everything referred to as costs are costs for the health care system not proxy costs as charges for the patient.

(Abstract) Costs (defined as the cost for society) were calculated.

Costs are defined as the cost for society since the health and welfare systems in Sweden are tax financed. Hospitalization costs per hospital day were taken from estimates made by the civic administration of the city of Göteborg, differentiating between general ward, stroke unit and rehabilitation ward. The cost included both a “hotel” cost (staff costs, rent costs and overhead costs for food, medications, cleaning, washing and transportation) as well as a patient related cost for medical examinations and treatments. Estimated costs per day at the day clinic were obtained from the Sahlgrenska University Hospital economy department. The costs for other types of outpatient care were taken from estimates by the civic administration. The services recorded for the cost after discharge were visits to a physician, physiotherapist, occupational therapist, nurse, psychologist, speech therapist etc. e.g the costs for the health care sector to supply the service.

No 9. For both direct and indirect cost all the explanatory variables were entered and analysed together. The explanatory variables included in the models were selected according to our hypothesis based on clinical experience. See answer also on question 2.

No 10. Since the sample is rather limited, we have not done any analysis regarding outliers or a sensitivity analysis.

No 11. Under the description of the instrument AMPS in the methods a description of the use of logits is provided. The conversion from raw scores to Rasch analysed measure in logit is
the standard procedure for the instrument and a detailed explanation of the advantage of that you can find in reference 16.

The occupational therapist observes the subject perform two ADL tasks and scores the performance in each item on a four-point scale, where 4=competent, 3=questionable, 2=ineffective and 1=markedly deficient. The raw scores are then entered into the AMPS computer program which converts the ordinal data into a linear measure (logit) of ability in motor and process skills [16, 17].

No 12. Thank you for pointing out this lack of information. The fact is that the regression analysis is performed using SEK. We have added information on an approximation of conversion rate and we hope it will be more understandable how we obtained the approximate cost of one logit increase in ability.

In the regression analysis of direct costs the determinants “severe aphasia” and “process skill” (AMPS) were statistically significant. With one logit higher process skill, the cost decreased by 16 920 € (156 098 SEK) and the cost for a patient without aphasia was 34 165 € (314 928 SEK) less than a patient with severe aphasia (Table III).

In the regression analysis of the cost for assistance of informal care giving the determinants “home integration” and HRQol were statistically significant. Compared to not being integrated in the home, an integrated patient cost 3 623 € (33 383 SEK) less in terms of costs for informal care giving. For each degree higher on the EQ-5D thermometer from 0-100, the cost for informal care giving was almost 65 € (572 SEK) less (Table IV).

Table III. Linear regression of direct costs and factors affecting the cost.

<table>
<thead>
<tr>
<th>Direct costs</th>
<th>Model</th>
<th>Parameter estimates</th>
<th>Std. Error</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted R²</td>
<td>0.373</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sign.</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>1 027 757</td>
<td>99 650</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Mild aphasia</td>
<td>22 860</td>
<td>118 075</td>
<td>0.847</td>
<td></td>
</tr>
<tr>
<td>Severe aphasia</td>
<td>314 928</td>
<td>111 617</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>-217 887</td>
<td>126 288</td>
<td>0.092</td>
<td></td>
</tr>
<tr>
<td>Motor ability (AMPS)</td>
<td>-4 446</td>
<td>66 068</td>
<td>0.947</td>
<td></td>
</tr>
<tr>
<td>Process ability (AMPS)</td>
<td>-156 098</td>
<td>74 289</td>
<td>0.042</td>
<td></td>
</tr>
</tbody>
</table>

Table IV. Linear regression of indirect costs and factors affecting the cost.

<table>
<thead>
<tr>
<th>Indirect costs</th>
<th>Model</th>
<th>Parameter estimates</th>
<th>Std. Error</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
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<tr>
<td>Sign.</td>
<td>0.003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>60 719</td>
<td>21 389</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td>Mild aphasia</td>
<td>6 133</td>
<td>14 781</td>
<td>0.682</td>
<td></td>
</tr>
<tr>
<td>Severe aphasia</td>
<td>-7 254</td>
<td>14 077</td>
<td>0.612</td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>13 339</td>
<td>18 700</td>
<td>0.484</td>
<td></td>
</tr>
<tr>
<td>Motor ability (AMPS)</td>
<td>-5 880</td>
<td>7 246</td>
<td>0.426</td>
<td></td>
</tr>
</tbody>
</table>
### Minor revisions:

1. According to most statistical literature, SD should be used for normal distributed samples. In the text and tables where we only give mean, we also give the range. The data for length of stay is not normally distributed (checked with Kolmogorov-Smirnov), and this carry over to the costs estimations.
2. Ability is changed to process skill.
3. Mean age is presented each time younger appears.
4. Changed as suggested.
5. Table I is changed according to a-c.
6. 5d and e. We regret that as there are difficulties to read the exact numbers from the data of Sweden and make statistical comparisons this is not added in the article.
6. Concerning SD see above (1). We are afraid we do not understand what you mean by giving “grand totals for the costs in Euro” but have added a total cost of the 3 variables in the summary at the bottom of table II. Concerning costs and charges we have made some clarifications (see above 8) that there are no charges but only costs for the society.

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### Referee 3

We have tried to clarify that with the randomisation there were equal numbers of patients in each group (N = 29) but in this paper all 58 patients were included together in the analyses.

Mean age is provided in table I.

We have altered the discussion and added the following sentence. The sample of patients in this study is representative for persons with stroke in this age in Sweden, with a “high” proportion of men and also of haemorrhage as cause of stroke {Riks-stroke, 2002 #241}.

The methods section is rewritten and re-organized to make the recruitment process clearer. See the following

“The paper focuses on patients with a first occurrence of stroke admitted to the rehabilitation clinic. The patients (under the age of 65 years of age) who were referred for in-patient rehabilitation were predicted to return to home, but needed more time than what was possible to give at the stroke unit. Consecutively these patients with a first occurrences of stroke were approached for inclusions (58 persons) in a in a randomised controlled study (Table I), intending to assess the effects of three weeks of rehabilitation after discharge aiming at improved adaptation {Bjorkdahl, 2006 #372.}. Randomisation was performed the last week before discharge not to influence the length of stay. In this paper the analyses are based on the whole sample of 58 persons.”

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<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process ability (AMPS)</td>
<td>-7 056</td>
<td>10 440</td>
<td>0.507</td>
</tr>
<tr>
<td>HRQol (EQ-5D)</td>
<td>-572</td>
<td>244</td>
<td>0.029</td>
</tr>
<tr>
<td>Home integration(CIQ)</td>
<td>33 383</td>
<td>10 282</td>
<td>0.004</td>
</tr>
</tbody>
</table>
Thank you for the comment of hospitalisation, which we had missed to analyse. We checked the data and have added the information in the result section.

“During the first year after discharge, 18 patients (31%) had been admitted to the hospital at an average cost of 2076 Euro. The length of stay varied between 1-21 days, median 1 day. One person suffered a second stroke (20 days), 2 suffered from debut of epilepsy, and one required hospitalization due to severe depression (21 days), the rest had a mix of reasons such as stomach cramps, fractures etc which required 1-2 days of observation or interventions.”

In the hospital system in Sweden the term hotel cost included medication since this is not entered into the economic system per patient but per ward unit. We have, however, re-written the paragraph to make it clearer (we think) what we mean with costs, and also present the costs in a longitudinal order.

“Costs are defined as the cost for society since the health and welfare systems in Sweden are tax financed. Hospitalization costs per hospital day were taken from estimates made by the civic administration of the city of Göteborg, differentiating between general ward, stroke unit and rehabilitation ward. The cost included both a “hotel” cost (staff costs, rent costs and overhead costs for food, medications, cleaning, washing and transportation) as well as a patient related cost for medical examinations and treatments. Estimated costs per day at the day clinic were obtained from the Sahlgrenska University Hospital economy department. The costs for other types of outpatient care were taken from estimates by the civic administration. The services recorded for the cost after discharge were visits to a physician, physiotherapist, occupational therapist, nurse, psychologist, speech therapist etc. e.g. the costs for the health care sector to supply the service.

We have entered the definitions of motor and process skills used in this paper.

“Motor skills are defined as the observable goal directed actions the persons enacts the performance of ADL tasks in order to move oneself or the object. Process skills are defined as the observable actions of performance the persons execute to logically sequence of the ADL task performance over time, select and use appropriate equipment and adapt performance when problems are encountered.”