The construction of a Complexity Classification System for Inpatient Rehabilitation Facilities

Comparing functional outcome measures in stroke for financing purposes

Authors
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1. Why this subject?
2. Introduction
3. Methodology
4. Results
5. Conclusions and Discussion
Last year, at the PCSI conference held in Lisbon, this team presented a paper where a review of the implementation of the ICF for a patient classification system was made.

At the end, someone asked if we had compared the ICF results with the use of other scales.

Our answer was: *No, we didn’t...!*
Throughout the past year, while our work was in progress...

“The development of a classification system for rehabilitation”

...many others continued to ask us the same question.
In the urge to attend this conference and wanting to visit Japan

We developed a study that addressed this particular question ...

So, one year after the 24th PCSI Conference, here we are trying to answer you that same question.
1. Why this subject?
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This paper focuses on post-stroke inpatient rehabilitation;

- **Compares** different **methods** for classifying patients in order to assess their level of dependency;

- In terms of financing, Portuguese inpatient rehabilitation hospitals are remunerated on a **per diem basis**;

- The Portuguese Ministry of Health requested the development of a **financing system**, according to **complexity levels**.

*Our team at the Portuguese Ministry of Health is working on this issue...*
Why Stroke?

• Because in rehabilitation we find **multiple conditions** that require an **individual** analysis;

• Because of its **impact and incidence**;

• Because **STROKE** rehabilitation is varied and complex and comprises a wide range of multidisciplinary programs;

• Because **STROKE** rehabilitation management depends on the assessment of the patients’ functioning;

• Because considering **STROKE**’s wide scope of impact, numerous measures exist to assess the dependency level.
And here begins the discussion...

• In Portugal rehabilitation professionals do not use outcome measure instruments in a systematic way, as part of a total evaluation plan to enhance health services purchaser decision making.

• The need to develop and implement a process for measuring complexity in rehabilitation has long been acknowledged.
There is no overall agreement to what and how it should be measured...

Especially when we are talking about financing...

Health professionals and managers hinder us the way...with many (relevant) questions.
... this study has enabled us to respond to some of those questions

but ... we realize that we must overcome many barriers ...
The consensus...

A large number of outcomes are relevant to the evaluation of dependency;

Some have to do with the immediate consequences of the patients’ clinical condition...

...others with late effects, more remote in time.
• A classification system introduces a set of variables that are important for financing care...

...we only considered the levels of dependency because they are the main factor to determine not only the **complexity** but also **the costs of the episodes**.
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Objectives

• Make a comparison between the most common rehabilitation outcomes measure instruments;

• Identify if the level of dependency being measured is the same regardless of the instruments used.
Statistical Methods

- Exploratory analysis using univariate, bivariate and multivariate statistical methods;

- Parametric tests to evaluate instruments score means according to gender, age, IRF and LOS;

- The Pearson correlation coefficient to determine levels of linear association between the three classification instruments;

- Hierarchical clustering methods to group cases in order to understand if cases were placed in the same group of dependency.
• Data included was gathered in **two inpatients rehabilitation facilities (IRF)**;

• **Cases were classified** with FIM, BARTHEL and ICF by **two clinicians**;

• Variables included were also:

  ✓ **Age and gender**
  ✓ **Type of stroke**
  ✓ **Comorbidities**
  ✓ **Length of stay (LOS)**

All instruments were applied **retrospectively**, according to data present on clinical records.
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In a total of 381 cases....

- 60% were men
- Average age 58 years
- ALOS 88 days

- Significant higher levels of dependency for women in all the instruments.
- Significant higher dependency levels for older groups on BI and FIM, but not for ICF.
• No statistically significant difference between LOS and mean total score for all the instruments (?)
• Significant differences between IRF and the mean total score for all the instruments (?)
• Significant differences between IRF and the mean number of comorbidities (?)
Comparing instruments by general results...

• For **ICF no patients** were classified with a maximum score of **160** (total dependency);

• For **FIM and BI** some patients scored **0**;

• **Strong correlation** between the three instruments total scores and for **FIM and ICF motor and cognitive dimensions**;
Do instruments classify patients in the same way?

• **Hierarchical clustering** methods were used.

• They proceed in successive steps that form a structured tree-shape, starting with a matrix of proximities among the 381 cases.
These methods were separately applied to the data collected with FIM, ICF and BI with the objective of finding out:

1) the **number of groups** present in the data and ...

2) ...if different instruments lead to similar inpatient classifications.
... 

• All of the used clustering methods revealed the existence of two groups of inpatients dependency:
  ➢ Group 1 - higher dependency
  ➢ Group 2 - lower dependency
• BI classifies most patients with higher dependency

• ICF classifies most patients in the lower dependency group.

• FIM and ICF separate dimensions: FIM shows a higher tendency to classify patients in the lower dependency group than ICF.

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Number of Clusters(a)</th>
<th>n</th>
<th>Variables</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>237 &amp; 136</td>
<td>BI</td>
<td>3</td>
<td>11</td>
<td>2.4</td>
<td>2.4</td>
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<tr>
<td>2</td>
<td>2</td>
<td>250 &amp; 131</td>
<td>FIM (m)</td>
<td>21</td>
<td>48</td>
<td>6.8</td>
<td>10.4</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>123 &amp; 252</td>
<td>ICF (m)</td>
<td>88</td>
<td>62</td>
<td>8.1</td>
<td>13.1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>222 &amp; 159</td>
<td>FIM (c)</td>
<td>15</td>
<td>30</td>
<td>5.4</td>
<td>3.3</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>207 &amp; 168</td>
<td>ICF (c)</td>
<td>15</td>
<td>5</td>
<td>5.8</td>
<td>2.3</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>198 &amp; 183</td>
<td>FIM (total)</td>
<td>35</td>
<td>70</td>
<td>9.4</td>
<td>13.4</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>108 &amp; 267</td>
<td>ICF (total)</td>
<td>108</td>
<td>71</td>
<td>12.9</td>
<td>15.6</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>168 &amp; 213</td>
<td>FIM (m)</td>
<td>19</td>
<td>40</td>
<td>5.4</td>
<td>14.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FIM (c)</td>
<td>14</td>
<td>27</td>
<td>5.3</td>
<td>5.5</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>187 &amp; 188</td>
<td>ICF (m)</td>
<td>88</td>
<td>59</td>
<td>10.6</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ICF (c)</td>
<td>16</td>
<td>6</td>
<td>6.2</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Data cluster analyses
### Highest % of concordance found between instruments

<table>
<thead>
<tr>
<th>Instruments Compared</th>
<th>% of concordance between all compared instruments</th>
<th>Highest % of concordance found between instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Analysis 1, 2 and 3: BI*FIM (m)*ICF (m)</td>
<td>BI * FIM (m) * ICF (m) – 60.1%</td>
<td>BI and FIM (m) – 85.3%</td>
</tr>
<tr>
<td>b) Analysis 4 and 5: FIM (c)*ICF (c)</td>
<td>FIM (c) * ICF (c) – 80%</td>
<td></td>
</tr>
<tr>
<td>c) Analysis 1, 6 and 7: BI*FIM (total)*ICF (total)</td>
<td>BI*FIM (total)*ICF (total) – 60.6%</td>
<td>BI and FIM (total) – 81.8%</td>
</tr>
<tr>
<td>d) Analysis 1, 8 and 9: BI*FIM (m&amp;c)*ICF (m&amp;c)</td>
<td>BI*FIM (m&amp;c)*ICF (m&amp;c) – 70.5%</td>
<td>FIM (m&amp;c) and ICF (m&amp;c) – 83.7%</td>
</tr>
<tr>
<td>e) Analysis 6 and 8: FIM (m&amp;c)*FIM (total)</td>
<td></td>
<td>FIM (m&amp;c) FIM Total – 80.0%</td>
</tr>
<tr>
<td>f) Analysis 7 and 9: ICF (m&amp;c)*ICF (total)</td>
<td></td>
<td>ICF (m&amp;c) ICF total – 78.9%</td>
</tr>
</tbody>
</table>
GLOBAL RESULTS
Part One

• Strong correlation was found between FIM, ICF and BI total scores;

• When instruments are divided into motor and cognitive skills, correlations present even higher values;

• The strongest correlation occurs for motor skills assessment between FIM and BI. Those results suggest that higher correlations appear when items evaluated have the same kind of approach...

... as well as for ICF (motor) and BI.

Differences between ICF and FIM in the assessment of cognitive skills (in terms of number and kind of items) may explain lower correlations between the cognitive dimensions of the two instruments.
GLOBAL RESULTS
PART TWO

• 60% and 70% of the episodes are equally classified regardless of the instrument being used;

• In the remaining 30% to 40%, the ICF instrument shows a higher probability of classifying them as low dependency patients than the BI or the FIM;

• The higher concordance was for BI and FIM’s motor dimension: 85% of the episodes classified in the same group by both instruments;

• The second highest level of concordance found was between FIM and ICF when the motor and cognitive dimensions are evaluated separately: 80% of the episodes;

When two dimensions for ICF and FIM are used separately the rate of similar classification for BI FIM and ICF: 70% of the cases.
• Results also show the presence of subgroups with intermediate mean values or between the low and high dependency levels... ... illustrating the presence of non-pure profile cases.

The characterization of these subgroups in terms of

- IRF
- Comorbidities
- Age
- Gender

didn’t demonstrate a clear association.
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As a global conclusion one can point out that cases are differently distributed through the **two groups of dependency**, according to the three instruments.

Nevertheless, **more than 60% of the cases are classified in the same groups, whatever the instrument used.**
As a *(statistical)* overall conclusion:

- Cluster analysis showed the **presence of subgroups** of cases that do not fit well in any of the two clusters.
- **Most cases** show a **profile of higher or lower level of dependency** (pure profiles)...
  ... whereas **other cases do not have differences** strong and homogeneous enough to become a third group.
- **Subgroups** classified in different clusters by different instruments have mean values located nearby the middle or partition points of the two pure profiles.

*but...*

- **Probably hierarchical clustering methods** are not the best way to classify these types of episodes (population need to be partitioned into more homogeneous groups).

- If we use another statistical method would we come to the same conclusion that, regardless of the instrument used, we are measuring (almost) the same?
What clues has this study given for financing purposes?

- Further research should include clustering of the cases into two or more groups allowing the creation of fuzzy groups.

- In terms of inpatient rehabilitation budgeting, the application of fuzzy classification would not impose a dichotomic financing system of two different groups of dependency...

... leading instead to different financing levels according to the individual’s degree of dependency measured by the estimated grade of membership to each group.
Important issues...

- We are addressing a very **complex pathology**, with many other variables that could affect the results.
- Some level of **subjectivity** in the use of tools by rehabilitation professionals.

**Suggestions:**

A rehabilitation classification system should take into account all the factors that can influence final results and also that **strict coding rules** should be established to reduce potential bias.

The selection of an appropriate dependency assessment instruments has to rely on **what is to be measured**, on the **concepts contained in the instruments** as well as **on the purpose for which it is intended**.
Is it possible to reach an objective conclusion and say that we have the green light to move forward?

It depends on which direction we want to move!
We hope that we can work on your questions and bring you the answers next year, at the 26th PCSI Conference in Munich.

THANK YOU