Does the Glasgow Outcome Score Predict the Functional Independence Measure in Major Trauma Patients?

OPALS Site Investigators     November 2006
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There is a need to measure more than just mortality in trauma patients. Many tools are available – some complex and costly, other simple and inexpensive. The Functional Independence Measure (FIM) is one tool. Glasgow Outcome Scale (GOS) is another. What could one tell us about the other?
What is the Glasgow Outcome Score?

- The Glasgow Outcome Score (GOS) is a simple measure of functional outcome following major trauma.
- Categories range from 5 (good recovery) to 1 (death).
- GOS is useful to Trauma Registries as it is readily obtained from the patient chart.
- Few data regarding its validity.
What is the FIM Score?

• The Functional Independence Measure (FIM) score is the gold standard for measuring functional outcome following injury.

• Well validated - used in many clinical studies.

• Evaluates independence from 18 [dependent] to 126 [independent].

• Requires a trained nurse to administer the 18 item interview directly to the patient or proxy.

• A lot of work!
Objective

To determine how well the Glasgow Outcome Score compares with scores obtained using the Functional Independence Measurement system.
Methods

- Prospective cohort substudy of the Ontario Prehospital Advanced Life Support (OPALS) Major Trauma Study
- A convenience sample of adult out-of-hospital major trauma survivors treated in one city with mixed BLS-D/ALS EMS systems
Methods: Intervention

- Major trauma survivors were interviewed at discharge
- GOS and FIM scores were measured
Methods: Data Analyses

Data analyses included:

- Classification performance (sensitivity and specificity)
- Spearman correlation
- Kappa statistics
<table>
<thead>
<tr>
<th>Patient Characteristics (N=733)</th>
<th>Major Trauma Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean age, yrs</strong></td>
<td>44</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>16-94</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>75%</td>
</tr>
<tr>
<td><strong>Mean Trauma Scores</strong></td>
<td></td>
</tr>
<tr>
<td>Initial GCS</td>
<td>11</td>
</tr>
<tr>
<td>Initial GCS&lt;9</td>
<td>29%</td>
</tr>
<tr>
<td>Initial Revised Trauma Score</td>
<td>6.9</td>
</tr>
<tr>
<td>Injury Severity Score</td>
<td>24</td>
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</tbody>
</table>
### Patient Characteristics (N=733)

<table>
<thead>
<tr>
<th>Major Trauma Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury Mechanism</td>
</tr>
<tr>
<td>Blunt</td>
</tr>
<tr>
<td>Penetrating</td>
</tr>
<tr>
<td>EMS Endotracheal Intubation</td>
</tr>
<tr>
<td>EMS Intravenous line</td>
</tr>
</tbody>
</table>
Distribution of GOS Scores

<table>
<thead>
<tr>
<th>GOS SCORE</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2=Death/Vegetative</td>
<td>24</td>
</tr>
<tr>
<td>3=Severe</td>
<td>201</td>
</tr>
<tr>
<td>4=Moderate</td>
<td>111</td>
</tr>
<tr>
<td>5=Good</td>
<td>397</td>
</tr>
</tbody>
</table>
Distribution of FIM Scores

No. of Cases

FIM Score

<30  31-50  51-70  71-90  91-110  >120

59  55  61  102  189  267
Distribution of FIM by GOS Category

GOS 5 ‘Good Recovery’

GOS 4 ‘Moderate Disability’

GOS 3 ‘Severe Disability’

GOS 1/2 ‘Dead or Vegetative State’

FIM Score
# Univariate Agreement of GOS and FIM Scores

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>FIM Median</td>
<td>102</td>
</tr>
<tr>
<td>GOS Median</td>
<td>5</td>
</tr>
<tr>
<td>Agreement</td>
<td></td>
</tr>
<tr>
<td>kappa</td>
<td>0.14</td>
</tr>
<tr>
<td>Spearman</td>
<td>0.66</td>
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</tbody>
</table>
Accuracy of GOS for Predicting ‘Good’ FIM Scores

<table>
<thead>
<tr>
<th>GOS</th>
<th>FIM  &gt;115</th>
<th>FIM &lt;115</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Recovery (GOS = 5)</td>
<td>185</td>
<td>22</td>
</tr>
<tr>
<td>At Least Moderate Disability (GOS &lt; 5)</td>
<td>212</td>
<td>314</td>
</tr>
</tbody>
</table>

- Sensitivity: 47% (42-52%)
- Specificity: 94% (91-96%)
- PPV: 89%
- NPV: 60%
### Accuracy of GOS for Predicting ‘Poor’ FIM Scores

<table>
<thead>
<tr>
<th>GOS</th>
<th>FIM</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>At least severe disability (GOS ≤ 3)</td>
<td>&lt;75</td>
<td>159</td>
<td>33</td>
</tr>
<tr>
<td>Moderate disability to Good Recovery</td>
<td>≥75</td>
<td>66</td>
<td>475</td>
</tr>
<tr>
<td>(GOS &gt; 3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td></td>
<td>71%</td>
<td>(65-77%)</td>
</tr>
<tr>
<td>Specificity</td>
<td></td>
<td>94%</td>
<td>(91-96%)</td>
</tr>
<tr>
<td>PPV</td>
<td></td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>NPV</td>
<td></td>
<td>88%</td>
<td></td>
</tr>
</tbody>
</table>
ROC Curve: Discrimination of GOS Levels in Identifying FIM Score

FIM < 75

Area = 0.85
ROC Curve: Discrimination of GOS Levels in Identifying FIM Score

FIM \geq 115

Area = 0.76
Discussion

- 54% of patients have good recovery according to the GOS, which is consistent with a median FIM of 102

- Distributions showed raters have some difficulty to differentiate moderate vs. severe disability using GOS

- Spearman showed fair correlation and kappa association was poor
Discussion

- GOS is highly specific to rule in both good and poor FIM scores
- Choice of cut points for ‘good’ and ‘poor’ FIM scores was arbitrary
Conclusions

• This is the first study to compare the use of GOS and FIM instruments in major trauma survivors

• Refining definitions of GOS 3 vs. GOS 4 may improve differentiation of moderate vs. severe disability

• The GOS appears to be a simple and accurate predictor of functional outcome at discharge and may be used as both a clinical and a research tool for major trauma patients
Glasgow Outcome Score Definitions

5 – **Good Recovery**: resumption of normal life despite minor deficits

4- **Moderate Disability**: Disabled but independent; can work in sheltered setting

3- **Severe Disability**: Conscious but disabled; dependant for daily support

2- **Vegetative**: minimal responsiveness

1- **Death**
FIM Domains and Scoring

Points from each of 6 items are totaled to arrive at a score between 18 (lowest) and 126 (highest) independence:

1. Self Care
2. Sphincter Control
3. Transfers
4. Locomotion
5. Communication
6. Social Cognition
Is the Cerebral Performance Category Score a Valid Measure of Functional Outcome After Out-of-Hospital Cardiac Arrest?

OPALS PRG Annual Meeting 2005
Objective was to determine how well Cerebral Performance Category (CPC) Score compared with scores obtained using the Health Utilities Index Mark 3 (HUI3).

- OPALS Cardiac Arrest Dataset
- First study to compare CPC and HUI3 instruments in 1-year survivors of cardiac arrest
- CPC Score is a fair predictor of functional outcome relative to HUI3 Score
- CPC Score should not be considered a substitute for HUI3 Score for cardiac arrest survivors
What Are We Doing This Year??
BIPHASIC Trial Cases 2002-2005 (N=256)

- Received at least 1 Biphasic AED shock (N=221)
  - Non-Cardiac (N=2)
  - No Data Download (N=7)
  - Shocked on Asystole (N=26)

- Survived to Hospital Discharge (N=36)
  - Died (N=185)