Cost-effectiveness analysis (CEA) of a continuous chain of rehabilitation after severe traumatic brain injury

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Severe TBI (sTBI) represents a substantial financial burden on the health care system, as well as on patients, family and society. Hence, treatment with the potential for reducing these burdens is demanded.

Our previous study suggests that a combination of medical treatment and early continuous rehabilitation could reduce the length of hospital stay and better functional outcome for patients with sTBI.

However, the long-term cost-effectiveness of rehabilitation after sTBI has yet to be determined.
Study aims

✓ To compare the cost-effectiveness of a continuous chain of rehabilitation trajectory with a broken chain rehabilitation trajectory for patients with sTBI.
Study population and design
2005-2007

 ✓ Inclusion criteria:
   - Age 16–55 years
   - ICD-10 diagnosis of intracranial injuries (S06.1-S06.9)
   - Glasgow Coma Scale (GCS) score ≤ 8
   - Need of neuro-intensive care for at least 5 days
   - Survival 5 years post-injury

Two study groups

✓ **Medical treatment and Continuous chain of rehabilitation, n=30**
  (i.e. directly transfer from the ICU to specialized brain injury rehabilitation entities).

✓ **Medical treatment and Broken chain of rehabilitation, n=29**
  (i.e. discharge to local hospitals and delayed admission to brain injury rehabilitation).

✓ Both groups were followed-up at 6-weeks, 1-year and 5-years post-injury.
Analysis: A decision tree model

sTBI patient

Broken

Eastern n=21

Southern n=9

Ullevål n=9

Vestre Viken n=3

Innlandet n=7

Ahus n=5

Other n=5

Cost/Effect
✓ Incremental cost-effectiveness ratio (ICER) of continuous versus broken chain of rehabilitation.

\[
ICER = \frac{\text{Cost of continuous chain} - \text{Cost of broken chain}}{-(\text{Health effect of continuous chain} - \text{Health effect broken chain})} = \frac{\Delta C}{\Delta E}
\]

✓ The costs were estimated by means of average costs per diagnosis related group (DRG).

✓ The health effect was based on point estimates from the Disability Rating Scale (DRS).
## Results - Costs

<table>
<thead>
<tr>
<th>Rehab. trajectory</th>
<th>Number of patients (N)</th>
<th>Average 1 year cost per patient USD, (SD)</th>
<th>Average 5 years cost per patient USD, (SD)</th>
<th>Mean LOS 1year/5 year (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>30</td>
<td>196,092 (72,968)</td>
<td><strong>207,498 (77,162)</strong></td>
<td>103/115</td>
</tr>
<tr>
<td>Acute hospitals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rehab. units</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broken</td>
<td>29</td>
<td>198,943 (117,420)</td>
<td><strong>213,705 (127,485)</strong></td>
<td>133/148</td>
</tr>
<tr>
<td>Acute hospitals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rehab. units</td>
<td></td>
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</tr>
</tbody>
</table>

**Note:** The values in parentheses indicate standard deviation (SD).
Results - Health effect

Area under the curve according to rehabilitation trajectories

- Continuous
- Broken

Disability Rating Scale

- 6 weeks
- 1 year
- 5 years
## Results - ICER

<table>
<thead>
<tr>
<th>Time perspective</th>
<th>Rehab. trajectory</th>
<th>C ($)</th>
<th>E</th>
<th>C/E</th>
<th>ΔC</th>
<th>ΔE</th>
<th>ICER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>Continuous</td>
<td>196,092</td>
<td>6.95</td>
<td>27,997</td>
<td>-2,852</td>
<td>0.83</td>
<td>Dominant*</td>
</tr>
<tr>
<td></td>
<td>Broken</td>
<td>198,943</td>
<td>7.78</td>
<td>24,903</td>
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<tr>
<td>5 years</td>
<td>Continuous</td>
<td>207,498</td>
<td>19.40</td>
<td>10,692</td>
<td>-6,207</td>
<td>4.06</td>
<td>Dominant</td>
</tr>
<tr>
<td></td>
<td>Broken</td>
<td>213,705</td>
<td>23.46</td>
<td>9,420</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The strategy that is less costly and more effective*
Continuous chain is more effective and less expensive than broken chain.
Under some reasonable assumptions, our study results suggest that the continuous chain of rehabilitation not only improves patients’ outcome, but is also cost-effective.

The knowledge generated by this study could be used to improve resource allocation and develop better rehabilitation programs for patient with sTBI.
Thank you for your attention!

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