



Trends in Canadian Inpatient Rehabilitation Outcomes Following Traumatic Brain Injury

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Background

The benefits of inpatient rehabilitation (IR) following traumatic injury are well established.¹ Given the substantial costs of IR for traumatic brain injury (TBI) in Canada,² further research into how Canadian IR outcomes differ based on level of disability and how these outcomes are changing over time is warranted. This study investigated trends in IR admission characteristics and outcomes for clients with moderate to severe TBI using data from Canada's National Rehabilitation Reporting System (NRS).

Methods

Using NRS data, trends in IR outcomes were analyzed for TBI clients discharged from IR between April 1, 2011, and March 31, 2016 (n = 5,582).

Admission characteristics and outcomes were analyzed by grouping TBI patient episodes based on their designated Rehabilitation Patient Group (RPG). The RPG methodology uses Admission Total Function Scores³ to predict the relative resource utilization of clients in the same diagnostic category. The RPG is used as a proxy for level of disability in this analysis. Patient episodes were divided into 3 groups based on similarities in 2016–2017 rehabilitation cost weights: most resource intensive (RPG 1200), moderately resource intensive (RPGs 1210, 1220 and 1230) and least resource intensive (RPGs 1240 and 1250).

Patient episodes with time between onset of TBI and admission to IR at or above the 99th percentile were removed from all analyses because of the magnitude of their difference from the overall population.

Confidence intervals and chi-square analyses were used to determine statistical significance.

i. Measures of client function used in this analysis are based on data collected using the FIM® instrument. The FIM® instrument, data set and impairment codes referenced herein are the property of Uniform Data System for Medical Rehabilitation, a division of UB Foundation Activities, Inc.

About the NRS

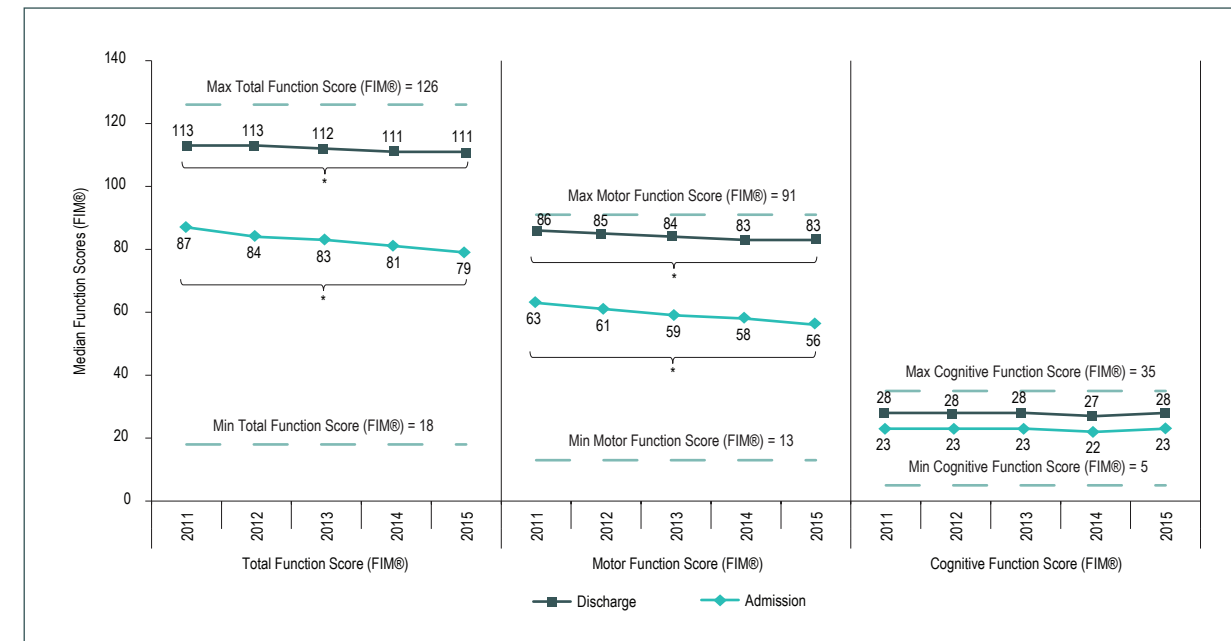
The NRS contains client data related to adult inpatient rehabilitation in Canada. As of 2016–2017, the NRS contained 17 years of data from more than 100 facilities in 9 provinces.

Facilities collect data on admission and discharge from the inpatient rehabilitation program and send it to the Canadian Institute for Health Information. Flexible comparative electronic reporting is available for all participating facilities, and data is also made available to the public through Quick Stats and focused analytical publications.

For more information
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Results

Figure 1 Admission and Discharge Total Function scores (FIM®) decreased over time



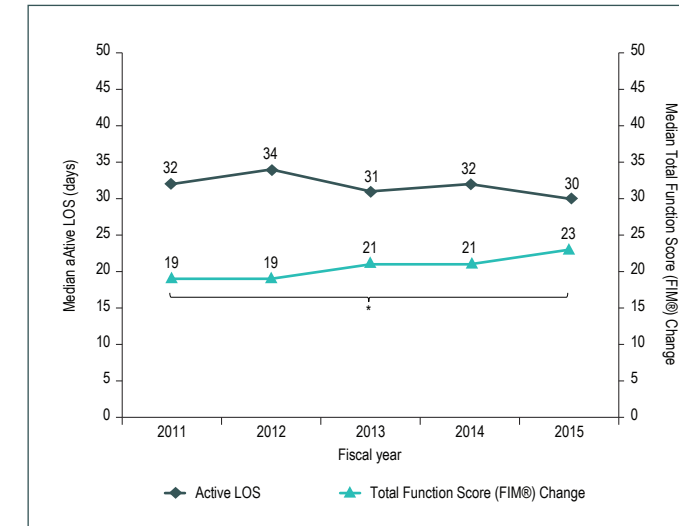
Note
* p<0.05.
Source
National Rehabilitation Reporting System, 2011–2012 to 2015–2016, Canadian Institute for Health Information.

Table 1 Admission characteristics and IR outcomes by resource utilization grouping

		Least resource intensive (RPGs 1240 and 1250)	Moderately resource intensive (RPGs 1210, 1220 and 1230)	Most resource intensive (RPG 1200)
Sex	Number of episodes	2,722	2,642	218
	Female	28%	29%	29%
Age	Male	72%	71%	71%
	Median	55	56	41
Onset Days	Mean ± SD*	53 ± 22	55 ± 22	44 ± 21
	Median	24	33	82
	Mean ± SD*	42 ± 79	57 ± 85	128 ± 141
Active LOS	Median	25	40	85
	Mean ± SD*	30 ± 28	51 ± 53	107 ± 95
Admission Total Function Score (FIM®)	Median	98	66	21
	Mean ± SD*	97 ± 15	67 ± 21	22 ± 4
Discharge Total Function Score (FIM®)	Number of episodes	2,664	2,526	203
	Median	117	103	40
Total Function Score (FIM®) Change	Mean ± SD*	114 ± 11	96 ± 23	52 ± 31
	Median	15	28	17
Days Waiting for Discharge	Mean ± SD*	17 ± 13	29 ± 20	30 ± 30
	Percentage of episodes with a wait*	6%	12%	20%
	Median	6	15	24
Returned Home	Mean ± SD*	16 ± 25	36 ± 64	53 ± 65
	Percentage of episodes with return home*	88%	70%	30%

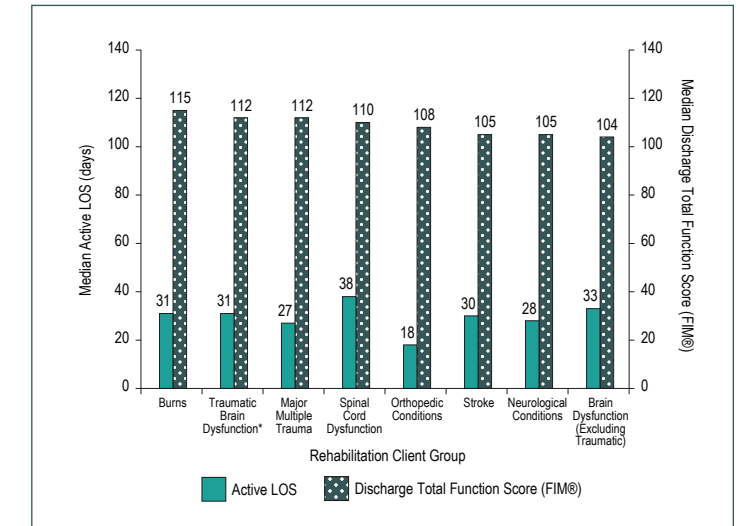
Notes
* p<0.05.
SD: Standard deviation.
LOS: Length of stay.
Active LOS excludes service interruption days and days waiting for discharge.
Percentage of episodes with return home refers to the percentage of episodes where clients lived at home prior to IR and were discharged home following IR.
Admission Total Function Score ranges:
• Most resource intensive group: 17 to 34 points.
• Moderately resource intensive group: 19 to 105 points.
• Least resource intensive group: 67 to 119 points.
Source
National Rehabilitation Reporting System, 2011–2012 to 2015–2016, Canadian Institute for Health Information.

Figure 2 Function Change (FIM®) and Active LOS over time



Notes
* p<0.05.
LOS: Length of stay.
Active LOS excludes service interruption days and days waiting for discharge.
Source
National Rehabilitation Reporting System, 2011–2012 to 2015–2016, Canadian Institute for Health Information.

Figure 3 Discharge Total Function Score (FIM®) and Active LOS by RCG



Notes
* Traumatic Brain Dysfunction = Rehabilitation Client Group subgroup 02.2.
LOS: Length of stay.
Active LOS excludes service interruption days and days waiting for discharge.
Source
National Rehabilitation Reporting System, 2011–2012 to 2015–2016, Canadian Institute for Health Information.

Summary of findings

Clients in the most resource intensive group tended to

- Be younger (median age = 41);
- Have higher onset days (median Onset Days = 82);
- Have longer active lengths of stay (median ALOS = 85 days);
- Be more likely to wait for discharge (20% waited); and
- Spend more time waiting for discharge (median 24-day wait for those who waited any days).

Clients in the moderately resource intensive group tended to

- Experience the highest functional gains (median Total Function Score [FIM®] Change of 28 points).

Clients in the least resource intensive group were

- More likely to return home (88% returned home) after IR.

Over the 5 years analyzed, the following trends in IR admission characteristics and outcomes were identified:

- There were decreases in both median Admission Total Function Score (from 87 to 79 points) and Motor Function Score (from 63 to 56 points).
- There were decreases in both median Discharge Total Function Score (from 113 to 111 points) and Motor Function Score (from 86 to 83 points).
- Admission function scores decreased at a greater rate than discharge function scores.
- Cognitive function scores remained stable.
- There was no statistically significant change in median Active Length of Stay (median was 30 days in 2015–2016).
- The median Total Function Score (FIM®) Change increased (from 19 to 23 points).

When compared with other RCGs, TBI clients are discharged from IR with relatively high levels of function:

- The median Discharge Total Function Score was 112 points, which corresponds with *modified independence* and 0 minutes of care required for activities of daily living.³

Discussion

- NRS data can be used to facilitate more proactive discharge planning conversations. By calculating a client's RPG upon admission and analyzing outcomes associated with that RPG, clinicians can gain a better understanding of the range of possible outcomes, anticipated lengths of stay and common barriers to discharge.
- Over the past 5 years, TBI clients were accepted into IR at continually lower functional levels and were discharged from IR at slightly lower functional levels. A statistically significant improvement in total function change was observed, and lengths of stay did not increase to achieve this improvement.
- TBI clients are discharged from IR with relatively high levels of function for activities of daily living.
 - Is this optimal care or should TBI clients be discharged from IR sooner?
 - Further analysis surrounding the barriers, benefits and consequences of earlier discharge from IR is recommended.
 - Further research into the availability of community-based rehabilitation and support services may be warranted to better understand the differences in discharge practices between RCGs.
 - Information about further functional improvement, maintenance or decline (e.g., through NRS follow-up assessments) would be valuable in improving our understanding of the benefits or consequences of earlier discharge from IR. Only 6.7% of NRS-participating facilities submitted follow-up data in 2015–2016. More widespread collection of follow-up data is recommended.

References

1. Nehra D, Bulger E, Cuschieri J, Maier R, Nixon Z, Lengenfeld C. Acute rehabilitation after trauma: Does it really matter? *Journal of the American College of Surgeons*. November 2016.
2. Chen A, Bushmeva K, Zagorski B, Colantonio A, Parsons D, Woodhull W. Direct cost associated with acquired brain injury in Ontario. *BMC Neurology*. August 2012.
3. Uniform Data System for Medical Rehabilitation. *The FIM® Instrument: Its Background, Structure, and Usefulness*. 2012.