Outcomes From Inpatient Rehabilitation Following Traumatic Brain Injury in Canada

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20 YEARS • ANS 1994–2014

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Canadian Institute for Health Information
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Purpose

In 2003–2004, the Canadian Institute for Health Information (CIHI) reported that there were 16,811 acute hospital admissions for traumatic brain injury (TBI) in Canada, an average of approximately 46 every day. While it is accepted that TBI has significant impacts on the lives of thousands of Canadian patients, as well as their caregivers and families, less is known about clients who receive inpatient rehabilitation (IR) for TBI and their outcomes. The present study sought to investigate selected client outcomes by severity following IR in Canada for TBI.

Methodology

Using data from the National Rehabilitation Reporting System (NRS), TBI patients discharged from IR between April 1, 2008, and March 31, 2013, (n = 4,503) were grouped based on their designated Rehabilitation Patient Group (RPG). The RPG methodology for TBI uses admission function scores[i] (including motor and cognitive scores) to predict the relative resource intensity of clients in the same diagnostic category. For the purposes of this analysis, clients were divided into three groups: **most** resource intensive (RPGs 1200 and 1210), **moderately** resource intensive (RPG 1220) and **least** resource intensive (RPGs 1230, 1240 and 1250). Clients whose time between onset of TBI and admission to IR (onset days) was in the 99th percentile were removed from all analyses, given the magnitude of their difference from the overall population.

i. Measures of patient function used in this analysis are based on data collected using the FIM® instrument, property of Uniform Data System for Medical Rehabilitation, a division of UB Foundation Activities, Inc.

Table 1: Characteristics of Patients Admitted to Inpatient Rehabilitation for Traumatic Brain Injury

| Client Group	Male/Female (%)	Age in Years, Mean (SD)	Total FIM® Score at Admission, Mean (SD)	Total FIM® Score Change, Mean (SD)	Onset Days, Mean (SD)	Onset Days, Median
Most Resource Intensive N = 1,036	70/30	49.0 (21.7)	41.2 (16.0)	38.6 (26.2)	76.1 (90.9)	46
Moderately Resource Intensive N = 957	78/22	47.8 (18.9)	86.0 (12.7)	23.2 (13.7)	51.4 (65.1)	35
Least Resource Intensive N = 2,510	72/28	52.5 (22.3)	95.1 (18.8)	17.5 (14.0)	38.4 (52.9)	25

Note
SD: Standard deviation.
Source
National Rehabilitation Reporting System, 2008–2009 to 2012–2013, Canadian Institute for Health Information.

### Figure 1: Onset Days and Inpatient Rehabilitation LOS* by Resource Intensity Group
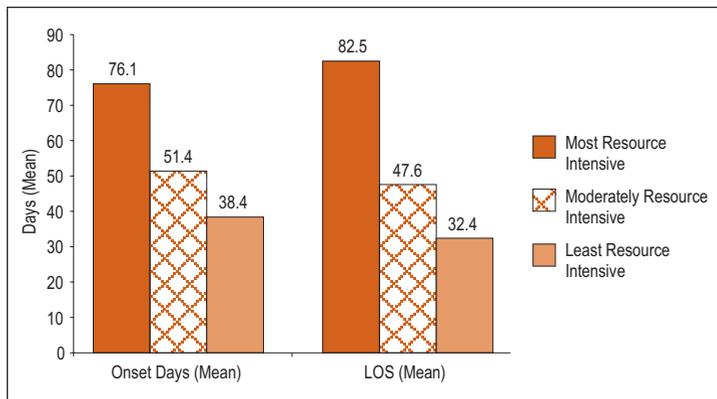
Note
* Length of stay (LOS) here excludes service interruption days.
Source
National Rehabilitation Reporting System, 2008–2009 to 2012–2013, Canadian Institute for Health Information.

Figure 2: Days Waiting for Admission and Days Waiting for Discharge
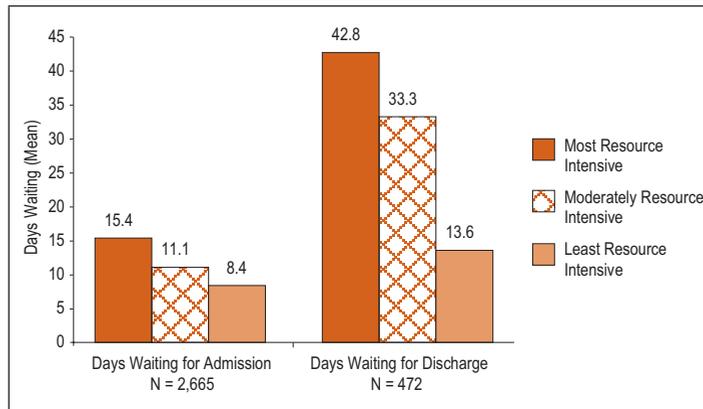
Note
N = number of patients who waited for admission/discharge (excludes cases in which wait = 0 days).
Source
National Rehabilitation Reporting System, 2008–2009 to 2012–2013, Canadian Institute for Health Information.

Figure 3: Patients Who Returned Home and to Work Following Inpatient Rehabilitation
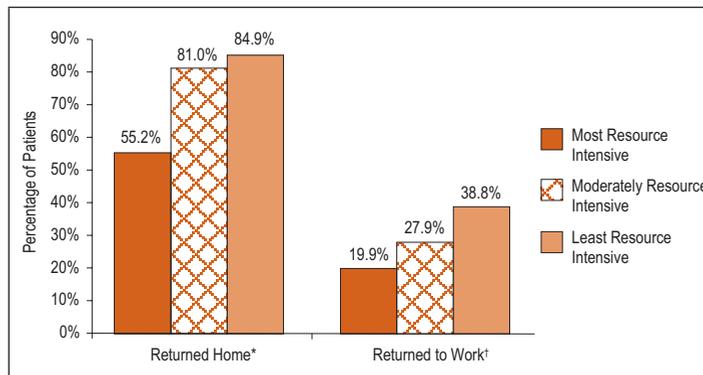
Notes
* Percentage of patients who were home prior to IR and/or acute care and were discharged home following IR.
† Percentage of patients who worked prior to IR and/or acute care and returned to work within one month following IR.
Source
National Rehabilitation Reporting System, 2008–2009 to 2012–2013, Canadian Institute for Health Information.

Summary of Findings

- Of those patients who waited for admission to IR, the mean admission wait days were greatest for the most resource intensive patients (15.4 days), compared with the moderately and least resource intensive groups (11.1 and 8.4 days, respectively).

- Patients who waited for discharge in the most resource intensive group waited on average 42.8 days, compared with 33.3 days for the moderately and 13.6 days for the least resource intensive groups.

- LOS was longest for the most resource intensive patients at 82.5 days, compared with 47.6 and 32.4 for the moderately and least resource intensive groups.

- The most resource intensive group also experienced the highest functional gains (mean total FIM® change = 38.6 ± 26.2), compared with total FIM® changes of 23.2 ± 13.7 and 17.5 ± 14.0 for the moderately and least resource intensive groups, respectively.

- Patients in the least resource intensive group returned home and to work (84.9% and 38.8%, respectively) more often after IR than those in the moderately (81.0% and 27.9%, respectively) and most resource intensive groups (55.2% and 19.9%, respectively).

Conclusions and Implications

NRS indicators show that the most resource intensive group had the longest LOS and admission wait days, compared with the moderately and least resource intensive groups. The majority of patients returned home within one month of discharge, but a much smaller proportion returned to work in the same time frame.

TBI patients in the NRS are more likely to return home or to work than are most clients in the NRS who receive IR for other impairments. Substantial recovery in clients admitted to IR with TBI in all intensity groups confirms that such clients can often benefit from IR.[1] However, CIHI's data demonstrates the need for further analysis and examination as to why the most resource intensive patients wait longer for admission to IR than other TBI patients.

A system management approach that aims to decrease days waiting for discharge may allow for a decrease in the days waiting for admission, particularly among the most resource intensive clients, who experience the longest delays in both admission and discharge. As seen in other rehabilitation client populations, a delay in admission can potentially affect rehabilitation outcomes in the most severely impaired clients.[1, 2] Sufficient resources should continue to be allocated to facilitate appropriate access to IR and improve return to work outcomes for TBI clients.

Our Vision
Better data. Better decisions. Healthier Canadians.

Our Mandate
To lead the development and maintenance of comprehensive and integrated health information that enables sound policy and effective health system management that improve health and health care.

Our Values
Respect, Integrity, Collaboration, Excellence, Innovation

About the National Rehabilitation Reporting System

The NRS contains client data related to adult inpatient rehabilitation in Canada. As of 2012–2013, the NRS contained 13 years of data from more than 100 facilities in nine provinces.

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

References

1. Wang H et al. Time to inpatient rehabilitation hospital admission and functional outcomes of stroke patients. *PMR*. 2011;3:296–304.
2. Cowen et al. Influence of early variables in traumatic brain injury on functional independence measure scores and rehabilitation length of stay and charges. *Arch Phys Med Rehabil*. 1995;76(9):797–803.

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January 2014