

Traumatic Brain Injury in Patients With Traumatic Spinal Cord Injury: Clinical and Economic Consequences

Cheryl L. Bradbury, PsyD, CPsych, Walter P. Wodchis, PhD, David J. Mikulis, MD, Ephrem G. Pano, BSc, MSc (Cand), Sander L. Hitzig, MA, Colleen F. McGillivray, MD, Fahad N. Ahmad, BSc, B. Catherine Craven, MD, Robin E. Green, PhD, CPsych

ABSTRACT. Bradbury CL, Wodchis WP, Mikulis DJ, Pano EG, Hitzig SL, McGillivray CF, Ahmad FN, Craven BC, Green RE. Traumatic brain injury in patients with traumatic spinal cord injury: clinical and economic consequences. *Arch Phys Med Rehabil* 2008;89(12 Suppl 2):S77-84.

Objective: To evaluate the clinical and economic burden of traumatic brain injury (TBI) in people with traumatic spinal cord injury (SCI).

Design: Prospective, case-matched control study.

Setting: Inpatient spinal cord rehabilitation program.

Participants: Patients ($n = 10$) diagnosed with traumatic SCI and concomitant TBI matched to an SCI-only control group.

Interventions: Not applicable.

Main Outcome Measures: Inpatient rehabilitation length of stay, health care costs (patient care hours), clinician resource allocation, behavioral and critical incidents, FIM, Personality Assessment Inventory, and neuropsychological assessment findings.

Results: Prolonged loss of consciousness, increased rehabilitation costs, and greater demands on clinician resources (trend) were found in the SCI with TBI group relative to the SCI-only group. Neuropsychological test performance was significantly worse in the SCI with TBI group, while the FIM cognition score did not discriminate because of ceiling effects. Greater evidence of psychopathology was observed in the SCI with TBI group.

Conclusions: The presence of TBI in SCI has a range of clinical and economic consequences. This dual diagnosis has the potential to affect SCI rehabilitation negatively, as well as quality of life and reintegration in the community. Specialized care appears to be needed to improve outcomes and to minimize clinical and economic burden, but further research is required.

Key Words: Brain injuries; Rehabilitation; Spinal cord injuries.

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THE CO-OCCURRENCE OF TBI with traumatic SCI represents a comorbidity with debilitating consequences. This dual diagnosis can pose clinical challenges that are more complex than either of these traumas on its own.¹ At present, there is a paucity of specialized dual diagnosis care, although it has been suggested that specialized care is critically needed to improve rehabilitation outcomes.¹⁻³ Aside from the complexity and expense, we suggest that the lack of specialized care may be a result of a dearth of information regarding the clinical and economic impact of TBI on patients with SCI. Thus, a fuller understanding of the impact of TBI on SCI may well be of significant clinical import.

In most cases of traumatic SCI and TBI, the causes of injury are the same, with motor vehicle collisions and falls accounting for approximately 70% of all TBI and traumatic SCI.³⁻⁵ Co-occurrence is common, with estimates of dual diagnosis ranging from approximating 25% of all traumatic SCIs to over 70%.³⁻¹⁴ Methodologic differences across studies likely explain this disparity.¹⁵ For example, incidence studies have differed in experimental design (eg, prospective vs retrospective),^{10,12-14} inclusion criteria,¹⁶ time postinjury,^{7,11,17} sampling techniques,¹⁸ and diagnostic criteria for TBI.^{1,13}

While even the most conservative estimates of dual diagnosis are of scientific interest and clinical concern, there is little research to date on its clinical and economic consequences. Conventional SCI rehabilitation involves the acquisition of new knowledge and skills in order to regain functional independence and facilitate recovery.¹⁸⁻²⁰ Cognitive sequelae would logically hamper or prolong this relearning.²¹ Moreover, behavioral sequelae might impede progress by causing patients to be branded as "difficult."²² Rehabilitation costs should also be higher if rehabilitation takes longer and/or is less effective. Arraga et al² speculated that the post-SCI medical and adjustment difficulties would be compounded by the presence of concurrent TBI; however, to our knowledge, only 2 studies have empirically examined this speculation. Richards et al²² conducted a prospective evaluation of the long-term consequences of TBI on SCI. Here, patients with dual diagnosis were compared with a matched SCI-only group on measures of

List of Abbreviations

| | |
|----------|--|
| GCS | Glasgow Coma Scale |
| LOC | loss of consciousness |
| LOS | length of stay |
| MRI | magnetic resonance imaging |
| PAI | Personality Assessment Inventory |
| PTA | posttraumatic amnesia |
| SCI | spinal cord injury |
| TBI | traumatic brain injury |
| WAIS-III | Wechsler Adult Intelligence Scale- Third Edition |
| WMS-III | Wechsler Memory Scale- Third Edition |
| WTAR | Wechsler Test of Adult Reading |

From the Toronto Rehabilitation Institute (Bradbury, Wodchis, Pano, Hitzig, McGillivray, Craven, Green); Department of Health Policy, Management and Evaluation (Wodchis); Graduate Department of Rehabilitation Sciences (Pano, Green), and the Department of Medicine (Craven, Mikulis, McGillivray), University of Toronto; Department of Psychology, York University (Hitzig); Toronto Western Hospital (Mikulis), Toronto, ON, Canada.

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Reprint requests to Cheryl Bradbury, PsyD, Toronto Rehabilitation Institute, 520 Eglinton Ave. W., Toronto, ON, M4G 3V9, Canada; e-mail: cbradbury@torrehab.com.

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Economic Consequences Of Traumatic Spinal Cord Injury

LL Leslie

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Table of Contents Economic Consequences Of Traumatic Spinal Cord Injury

1. Understanding the eBook Economic Consequences Of Traumatic Spinal Cord Injury
 - The Rise of Digital Reading Economic Consequences Of Traumatic Spinal Cord Injury
 - Advantages of eBooks Over Traditional Books
2. Identifying Economic Consequences Of Traumatic Spinal Cord Injury
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Economic Consequences Of Traumatic Spinal Cord Injury
 - User-Friendly Interface

4. Exploring eBook Recommendations from Economic Consequences Of Traumatic Spinal Cord Injury
 - Personalized Recommendations
 - Economic Consequences Of Traumatic Spinal Cord Injury User Reviews and Ratings
 - Economic Consequences Of Traumatic Spinal Cord Injury and Bestseller Lists
5. Accessing Economic Consequences Of Traumatic Spinal Cord Injury Free and Paid eBooks
 - Economic Consequences Of Traumatic Spinal Cord Injury Public Domain eBooks
 - Economic Consequences Of Traumatic Spinal Cord Injury eBook Subscription Services
 - Economic Consequences Of Traumatic Spinal Cord Injury Budget-Friendly Options
6. Navigating Economic Consequences Of Traumatic Spinal Cord Injury eBook Formats
 - ePub, PDF, MOBI, and More
 - Economic Consequences Of Traumatic Spinal Cord Injury Compatibility with Devices
 - Economic Consequences Of Traumatic Spinal Cord Injury Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Economic Consequences Of Traumatic Spinal Cord Injury
 - Highlighting and Note-Taking Economic Consequences Of Traumatic Spinal Cord Injury
 - Interactive Elements Economic Consequences Of Traumatic Spinal Cord Injury
8. Staying Engaged with Economic Consequences Of Traumatic Spinal Cord Injury
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Economic Consequences Of Traumatic Spinal Cord Injury
9. Balancing eBooks and Physical Books Economic Consequences Of Traumatic Spinal Cord Injury
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Economic Consequences Of Traumatic Spinal Cord Injury
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Economic Consequences Of Traumatic Spinal Cord Injury
 - Setting Reading Goals Economic Consequences Of Traumatic Spinal Cord Injury
 - Carving Out Dedicated Reading Time

12. Sourcing Reliable Information of Economic Consequences Of Traumatic Spinal Cord Injury
 - Fact-Checking eBook Content of Economic Consequences Of Traumatic Spinal Cord Injury
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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