

Transforming the path to recovery for brain injury: An integrated care model for chronic TBI and ABI patients that improves quality of life

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A practitioner's introduction for private rehab centre operators, clinicians and care providers for brain injury patients

Abstract

Rehab centre owners, clinicians and researchers across the healthcare system are looking for sustainable, evidence-based care models to transform the lives of individuals with chronic brain injury. Currently there are limited, scalable care models that have produced meaningful results, particularly in terms of transforming the quality of life for these individuals.

ABI Wellness licenses a financially viable and research-backed solution for clinics striving to improve higher order cognitive functioning of their patients and increase their overall revenue; while effectively reaching more patients that struggle with the long-term impacts of brain injury. ABI Wellness's interdisciplinary four-pillar, evidence-based approach is designed to help individuals with brain injuries restore lost executive cognitive functions – such as memory, reasoning, attention, planning abilities and overall self-awareness – during the post-acute stage of recovery. This data-driven, high order cognitive rehabilitation program offers measurable return on investment (ROI) and ensures a higher volume of patients and increased revenue stream of up to 30%. With a structured program that utilizes automated tools, ABI Wellness delivers up-to-the-minute patient activity and satisfaction tracking, with the added bonus of less staff administration and labour-intensive activities.

Providing health care professionals with the tools to assist them in developing their patients' neurological capacities in higher order cognitive functioning, ABI Wellness delivers a cognitive intervention system that will improve patients' quality of life and return to work possibilities.

The Challenge

Defining the Condition

Acquired brain injury (ABI) is damage to the brain – traumatic or non-traumatic – that is not due to a congenital disorder or a developmental disability and disrupts normal function of the brain after birth.

Traumatic brain injuries (TBI) include any external force to the head or skull, including concussions or motor vehicle accidents, while non-traumatic brain injuries (nTBI) can stem from lack of oxygen, including anoxia or drowning, or cancer and diseases, such as brain tumours or meningitis.

Understanding the Magnitude of the Challenge

In North America, nearly 2.8 million people sustain traumatic brain injuries each year, resulting in 282,000 hospitalizations and approximately 50,000 deaths.¹ In Canada, traumatic brain injury affects individuals at an annual rate of 500/100,000, or more specifically, 166,455 and 22,000 in Canada and BC respectively each year.² Equivalent to 456 individuals each day, or one Canadian every three minutes, these injuries range from mild to severe, and result in substantial direct medical costs and indirect costs from loss of productivity.

Patients who survive moderate-to-severe TBI frequently suffer from a wide range of cognitive deficits and behavioral changes due to diffuse axonal injury. The need for lifetime support is due to long-term higher order cognitive weaknesses that impact attention, working memory, reasoning and overall self-awareness. One study concluded that cognitive abilities related to focus and awareness were the largest clinical implications of any higher order cognitive weakness.³ These deficits include slowed information-processing and impaired long-term memory, attention, working memory, executive function, social cognition and self-awareness.⁴

As acquired brain injury from traumatic and non-traumatic causes is a leading cause of death and disability across North America, it poses a huge economic burden to the public health care system.

In the first-year post-injury, the average cost per patient ranges between \$32,132 and \$38,018 for traumatic and non-traumatic brain injury respectively.⁵ Although the highest costs of patient treatment are absorbed in the first-year post-injury, the patients who are fortunate enough to afford continued treatment seek post-acute care for two years after injury. The average lifetime cost of a patient with acquired brain injury ranges from

¹ (BrainLine, 2017)

² (Langois et al., 2006).

³ (Zimmermann et al., 2017)

⁴ (Azouvi, Arnould, Dromer, & Vallat-Azouvi, 2017, p. 461)

⁵ (Chen et al., 2012)

\$85,000 to \$3 million; so even if a large portion of affected individuals cannot afford the substantial costs of treatment, there is still a considerable revenue stream attached to the ones that can.

Neuroplasticity and Chronic Brain Injury

The industry standard for patient rehabilitation after an acquired brain injury has occurred – also known as the acute recovery period – is two years, but many of these patients continue to exhibit higher order cognitive weaknesses that prevent them from returning to the workforce or partaking in regular activities.

Until recently, there was a lack of research and interdisciplinary offerings that focus on improving higher order cognitive functioning during post-acute recovery (or after the initial 24 months.) Providing a system that allows patients to help themselves develop these specific cognitive functions, ABI Wellness begins its journey with its clients over various points in the rehabilitation journey, typically following the 24-month initial treatment period has concluded.

Research supports that cognitive remediation increases the probability of returning to work years after patients experience brain trauma or injury.⁶ Further evidence illustrates that the brain has an incredible capacity to change, adapt and grow through programs that offer intervention and stimulation of existing cognitive functions. ABI Wellness licenses a unique and comprehensive program that focuses on changing the brain to improve higher order cognitive and related behavioural functions during the post-acute phase of recovery.

The Case for Cognitive Rehabilitation and Holistic Care

Research has shown that holistic care – including physical, psychological, social, emotional and spiritual healing – is a leading approach for brain injury rehabilitation and is a determinant of “good quality care”.⁷ The holistic care model looks at the patient’s unique experience with acquired brain injury and the dynamic relationship with their environment. ABI Wellness’s post-acute program, encompassing this four-pillar approach, takes a deep dive into each of these categories to ensure holistic patient care and recovery.

According to the guidelines set by Scottish Intercollegiate Guidelines Network (2014), post-acute rehabilitation programs should be delivered by an interdisciplinary team using a goal-focused program. Fully aligned with ABI Wellness’s approach, the Colorado Division of Worker’s Compensation (2012) agrees that these types of

⁶ (Mitrushina and Tomaszewski, 2017)

⁷ (Wright et al., 2016)

interdisciplinary cognitive rehabilitation programs help to improve patient mobility, personal care and independence in their daily lives.

In a series of six studies, conducted by the Canadian Agency for Drugs and Technologies in Health (2016), one study conclusively found that stroke patients with symptoms of non-traumatic acquired brain injuries are best supported through early discharge to the community, as opposed to conventional care in hospitals, due to equivalent health outcomes and decreased costs. The same study concluded that at-home rehabilitation achieves better health outcomes than conventional care.

Another study in Japan measured improvement levels for 300 traumatic brain injury patients using an interdisciplinary teamwork model that emphasized future employment.⁸ Evidence found that 46.4% of these patients received gainful employment or returned to school, concluding that long-term improvement is a likely possibility through interdisciplinary cognitive rehabilitation.

With these findings, one could conclude it poses great benefits for an acquired brain injury patient to enroll in a comprehensive rehabilitation program that focuses on higher order cognitive functioning with a holistic care approach.

The ABI Methodology

Based on learnings regarding neuroplasticity and the value of intervention for patients at the end of their “standard recovery period” – new models of care focusing on the needs of these patients are under development. The ABI Wellness model presents one such approach.

According to the research facilitated by University of British Columbia’s Djavad Mowafaghian Centre for Brain Health, the brain has capacity to change and regain cognitive functions well **after** the acute recovery period.⁹ These preliminary results were concluded from the impact of ABI Wellness’s four-pillar program and the patients who received treatment for acquired brain injuries with this approach.

This evidence-based, four-pillar approach includes:

- 1. Higher Order Cognitive Function Rehabilitation** using the Tested BrainEx cognitive rehabilitation tools and methodology
- 2. Aerobic Exercise** catered for brain injury patients and integrated with the other key pillars to optimize overall treatment plan
- 3. Mindfulness** through tailored sessions integrated in program
- 4. Holistic Health** including validated and reliable quality of life tracking to allow for quick intervention and engagement with patients

⁸ (Watanabe, 2013)

⁹ (Porter, Torres, Panenka, Rajwani, Fawcett et al., 2017)

As part of the license, ABI Wellness provides management, supervision and implementation of its program to the hospital groups, regional health authorities and non-profit clinics across North America that opt to partner with ABI Wellness. These licensee partners receive training, certification and access to intellectual property that has more than 40 years of success in improving cognitive abilities for people with brain injuries.

ABI Wellness uses the world-renowned BrainEx Program. This program focuses on higher order **cognitive rehabilitation**. Four specific exercises target the regions of the brain responsible for executive functioning. These four exercises are called Symbol Relations, Symbol Thinking, Nonverbal Thinking and Predicative Speech. These higher order cognitive exercises help to restore a patient's ability to organize, plan and set goals, in addition to building cognitive capacities in verbal memory, verbal retrieval, reasoning and enhance overall self-awareness.

Research proves that exercise and physical activity can regulate mood and anxiety in patients with brain injuries, so **aerobic exercise** plays a vital role in enhancing cognitive improvement. Aerobic exercise, as an integral part of ABI Wellness's program, prepares the brain for more effective higher order cognitive rehabilitation, and studies have shown that aerobic exercise alone has been found to improve mood and executive functioning for patients with brain injuries.¹⁰ Dr. Tanya Cabrita, a Psychiatrist and Sports Medicine Physician notes that: "... [ABI Wellness] is a one of kind, evidence-based approach that provides the structure, support and functional gains patients need to succeed. Although cognitive recovery is the focus, the multi-interventional approach provides amazing benefits that extend to physical and psychosocial areas," Dr. Cabrita also noted that "As a concussion specialist, I have had the opportunity to witness the transformation of benefits and healing in patients suffering from chronic brain injuries who have participated in the ABI Wellness Program. I highly recommend ABI Wellness to patients and healthcare professionals to improve the functional abilities and quality of life of those affected by acquired brain injuries."

Mindfulness has proven to reduce depressive symptoms, overall stress and fatigue in patients with traumatic brain injury. Studies found that mindfulness-based cognitive therapy was effective in reducing depression among the TBI population, in addition to reducing pain intensity and increasing energy levels.¹¹

As fatigue is one of the longest-lasting symptoms of brain injury, ABI Wellness's four-pillar approach includes 10-15 minutes of guided meditation each day.

The last pillar of ABI Wellness's four-pillar approach is **quality of life tracking**. This pillar includes structured goal setting and TBI specific quality of life tracking, which allows facilitators to monitor changes in patients' daily lives throughout treatment.

¹⁰ (Chin et al., 2015)

¹¹ (Bedard et al., 2012)

For those patients who are unable to commit to this half-day, comprehensive program, ABI Wellness offers a part-time solution that encompasses two of the four cognitive areas, including 80 minutes a day of higher order cognitive exercises and self-managed aerobic exercises.

Case Study 1: University of British Columbia Pilot

As part of ABI Wellness's ongoing research, ABI Wellness and the Faculty of Medicine at the University of British Columbia conducted a 3-month pilot study to understand the impacts of cognitive interventions using BrainEx cognitive training tools.

“The purpose of this pilot study was to assess the feasibility of an intensive three-month cognitive intervention program in individuals with chronic TBI and to evaluate the effects of this intervention on brain-behavioural relationships. Following the intervention, there was a statistically significant increase in the composite cognitive score in the TBI participants and a statistically significant decrease in functional connectivity in the right inferior frontal gyrus.” This indicates a shift towards healthier brain function.

“In addition, there was evidence of changes in the brain-behaviour relationships following intervention. The results from this pilot study provide preliminary evidence for functional network reorganization that parallels cognitive improvements after cognitive rehabilitation in individuals with chronic TBI.”¹²

ABI Wellness is continuing their partnership with UBC Faculty of Medicine with a 4-Pillar study to further investigate the impacts of an integrated care approach.

Case Study 2: Watson Society for Brain Health

Since 2016, the Watson Society for Brain Health has been working with individuals with chronic TBI and ABI using an integrated care approach; to transform the quality of care for these patients.

Critical to the Watson's centre is a focus on individuals with chronic brain injury, who have limited care options provided by legacy care models. Josh Poirier, Executive Director of the Watson Society for Brain Health notes: “ABI Wellness's program provides hope where there is little and provides gains where they are not expected. I wholeheartedly believe that this program can change lives of people recovering from a brain injury, and in turn, improve the lives of family and friends who support the recovery of their loved one. By helping to improve higher order cognitive functioning, it re-establishes connections in the brain that have been altered, thus allowing the brain to function in a way that is more efficient. Once the brain can work more efficiently, the potential of our patients can better align with their expectations and capabilities.”

¹² (Porter, Torres, Panenka, Rajwani, Fawcett et al., 2017)

Critical to the evolution of the care model was expanding from a cognitive base to integrating additional elements, including aerobic exercise. “Aerobic exercise enhances the speed at which patients move through higher order cognitive functioning,” Poirier notes, “I saw drastic improvements in not only physical fitness, but also stamina and endurance as patients returned to the cognitive room after a workout. Once we scheduled mindfulness into our day-to-day program, I witnessed our patients improve their abilities to be present in their bodies; predicting and managing any cognitive weaknesses.”

Creating a Sustainable Fiscal and Human Resourcing Model

One of the greatest benefits of ABI Wellness’s program is the ability to address the needs for care providers on the frontline, who are often burdened with the lack of structured programs and face unclear and unstandardized procedures with heavy caseloads. H  l  ne Th  riault, a clinical instructor at the Department of Occupational Science and Occupational Therapy at the University of British Columbia notes that an integrated approach, backed by technology “provides Occupational Therapists with a structured, yet tailored approach in the cognitive, physical and psychosocial areas of the individual, which will enable OTs to better support their clients in making functional gains in their home and community.”

As most outpatient or chronic rehabilitation programs rely on a 1:1 or 1:2 patient-to-staff model, many of these programs yield high costs for health care professionals.

In the example of a four-hour session, where an occupational therapist treats an individual patient and earns \$90/hour, three of those hours might be contributed to assessment and programming, while only an hour is left for rehabilitation; resulting in less cognitive training for the patient and higher costs for the clinic.

Using ABI Wellness’s data-driven approach, conducted in a group-setting to exemplify a 10:2 patient-to-staff ratio, the program aims both to significantly reduce the amount of time spent on individual cases and to decrease patient re-admittance to rehabilitation programs. ABI Wellness’s interdisciplinary model identifies the commonalities between brain injury patients to systematically deliver a holistic and well-rounded program, which helps the majority of acquired brain injury patients to succeed in long-term, post-acute recovery. A key component of one of the four pillars, quality of life tracking, allows patient assessment and programming to be facilitated through the program, so health care professionals can solely focus on patient rehabilitation. Dynamic, live reporting will result in early intervention by care providers, a rarity in most healthcare systems and patient settings. In this group-setting model, led by one occupational therapist and one rehabilitation assistant (who makes a fraction of the wages), the session has now significantly reduced its labour costs and increased patient intake.

With each patient investing approximately \$350 per session – in addition to substantially reduced labour costs through less labour-intensive activities and administrative tasks – clinics have the potential to increase overall revenue by up to thirty percent. Patients also receive more holistic care, as part of ABI Wellness’s interdisciplinary method, as opposed to traditional outpatient rehabilitation programs.

Improving and Streamlining Care Delivery

In addition to improving the scalability of care delivery for clinics, significantly reducing costs and increasing overall revenue, this integrated program will transform assessment and treatment process for patients who suffer from chronic brain injuries.

Typically offered as three, six or nine-month programs – with half-day, part-time or specialized program options – clinics and occupational therapists can better support their patients in making functional gains at home and in the community. With a structured-yet-tailored approach to the cognitive, physical and psychosocial areas of improvement, ABI Wellness offers certification, training and ongoing support and delivery of the program.

Not only will an integrated model, backed by scalable, but patient-centred data tracking help patients with brain injuries improve cognitive functions in short periods, but it will also allow your clinic to become an expert in brain injury and holistic care, while increasing patient intake.

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