

First Step Wellness Centre

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Executive Summary

First Step Wellness Centre (FSWC) is a non-profit organization in Regina that offers innovative, research-based rehabilitation services designed to decrease the severity of spinal-cord injuries (SCI). Whereas other Saskatchewan service providers focus on living in the community with a disability, FSWC approaches SCI's with exercise-based rehabilitation programs to reduce the severity of the injury. As a result, the FSWC approach creates the possibility of increasing clients' quality of life while simultaneously reducing the costs to themselves, their family and the Government of Saskatchewan.

There are currently 85,000 people living with a SCI in Canada and the medical costs associated with SCI's vary greatly depending on the location and severity of the injury. Direct costs include emergency medical services, initial hospitalization, inpatient care for re-hospitalization and nursing home stays, outpatient therapy, long-term attendant care, equipment and supplies for daily living purposes and mobility, as well as medical equipment and supplies for secondary conditions. Indirect costs include management of mental health such as medications, physician care, psychologist care and loss of work for the patient. These costs are shouldered by provincial governments and patients. Rates of employment and participation in the labour force may also be impacted by SCI severity, along with quality of life of patients and their families. FSWC services are designed to decrease the severity injuries, and thus decreases these costs.

Support for organizations like FSWC is found in the Saskatchewan Disability Strategy, which was released in June 2015. It recommends that the province should "identify demand, examine gaps and seek opportunities to expand or redirect human services. Begin addressing areas already shown to have significant gaps, including: Therapy providers..." FSWC methods are supported by leading research, such as the Rick Hansen Institute's National Environmental Scan, which suggested that access to provincially-funded community rehabilitation service providers who act as "extenders" to physician, nursing, and physical and occupational therapy providers could prevent the various secondary health conditions that plague individuals living in the community, and provide a cost-effective means of serving these individuals. Furthermore, FSWC aligns with many of the best practices established by a subsequent publication, "A Manifesto for Change" created jointly by the Rick Hansen Institute and the Toronto Rehabilitation Institute.

Appreciating FSWC's proven ability to reduce the severity of SCI's and thus, reducing the resulting costs to the province, this document provides two recommendation: 1) the Government of Saskatchewan provide direct financial support to FSWC; 2) formal acknowledgement that FSWC is a safe and effective option to inform patients in their decision-making.

Introduction

Choice of disability services that meet individual needs is a provincial priority according to the Saskatchewan Disability Strategy (Citizen Consultation Committee 2015) and best practice according to Saskatchewan-based research (Lynch and Findlay 2007). There are a few spinal cord injury (SCI) rehabilitation options in Saskatchewan, one of which is First Steps Wellness Centre (FSWC). FSWC is a non-profit organization in Regina that offers innovative, research-based services designed to decrease the severity of SCIs, whereas other providers instead emphasize living with disability. As shown below, less severe injury has been found to translate into a higher quality of life, higher income, lower costs to themselves and family members, and fewer associated health issues and hospital visits. Furthermore, the province benefits through related financial savings.

FSWC services however, are out of reach to many SCI patients who might otherwise choose them because hourly rates are primarily paid out-of-pocket and long-term therapy is required to experience the proven benefits. This is exacerbated by the disproportionately lower income experienced by people with disabilities in general. FSWC cannot further decrease its rates because it is already cutting costs by, for example, employing qualified students as assistants and aides. SCI patients who cannot afford to pay the full cost and receive inadequate financial assistance are thus not given a choice of rehabilitation service providers because they can only afford options that are paid for by a third party such as the government. Financial support paid directly to FSWC or directly to clients would partially resolve this problem. The province has a funding program that addresses the latter, but it is still nascent and other supports such as formal government approval would be required as a complement.

This proposal demonstrates that financial and non-financial support to FSWC are required to provide choice of services that meet the needs of individuals living with SCIs and to enable all SCI patients to work toward decreasing the severity of their injury and experiencing the myriad of associated benefits. First, we will provide background information on SCI in Canada, then healthcare models for treatment will be listed and explained. A list of costs associated with SCI will follow. Then the benefits provided by FSWC will be detailed. An overview of the costs of rehabilitation in dollars will come next. The proposal will end with recommendations and a conclusion.

Spinal Cord Injury in Canada

There are currently about 85,000 people living with a spinal cord injury (SCI) in Canada (Craven et al. 2012). The annual costs to individuals living with SCIs and to the Canadian healthcare system vary greatly due to the variability of injuries themselves and established guidelines for ongoing rehabilitation.

A spinal cord injury is assessed by location of injury, function, and neurologic level. As illustrated in Figure 2, location is grouped into four quadrants along the spine in descending order: Cervical (top eight vertebrae), Thoracic (next 12 vertebrae), Lumbar (next five) and Sacral (bottom five). Next, assessments of sensory, motor, and muscular function and neurologic level

are used to determine placement on the American Spinal Injury Association (ASIA) Impairment Scale. As shown in Figure 1 and Appendix 1, the scale categorizes the injury as “A,” “B,” “C,” “D,” or “E.” ASIA “A” is complete loss of all function, ASIA “B” indicates sensory function without motor function, ASIA “C” means that muscle function (scale 0-5) of at least 50% of muscles on one side of the body score 3 or lower, while ASIA “D” at least 50% of muscles on one side score level 3 or higher. ASIA “E” is normal function.

ASIA Impairment Scale (AIS)

A = Complete. No sensory or motor function is preserved in the sacral segments S4-5.

B = Sensory Incomplete. Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-5 (light touch or pin prick at S4-5 or deep anal pressure) AND no motor function is preserved more than three levels below the motor level on either side of the body.

C = Motor Incomplete. Motor function is preserved below the neurological level**, and more than half of key muscle functions below the neurological level of injury (NLI) have a muscle grade less than 3 (Grades 0-2).

D = Motor Incomplete. Motor function is preserved below the neurological level**, and at least half (half or more) of key muscle functions below the NLI have a muscle grade ≥ 3 .

E = Normal. If sensation and motor function as tested with the ISNCSCI are graded as normal in all segments, and the patient had prior deficits, then the AIS grade is E. Someone without an initial SCI does not receive an AIS grade.

** For an individual to receive a grade of C or D, i.e. motor incomplete status, they must have either (1) voluntary anal sphincter contraction or (2) sacral sensory sparing *with* sparing of motor function more than three levels below the motor level for that side of the body. The International Standards at this time allows even non-key muscle function more than 3 levels below the motor level to be used in determining motor incomplete status (AIS B versus C).

NOTE: When assessing the extent of motor sparing below the level for distinguishing between AIS B and C, the *motor level* on each side is used; whereas to differentiate between AIS C and D (based on proportion of key muscle functions with strength grade 3 or greater) the *neurological level of injury* is used.

Generally speaking, the higher the level of injury, the more body systems are affected, as shown in Figure 2. The type of injury will impact recovery time: if *swelling* that compresses the spinal cord disappears, then full recovery might be possible with minimal rehabilitation, whereas *damage* to the cord has been traditionally seen as less reversible with greater focus on living with the injury rather than recovery. This model of rehabilitation is shifting, however, to a dynamic approach known as neuro-rehabilitation, which supposes that neural function is not static and can be reclaimed or retaught through rehabilitation (Behrman, Bowden and Nair 2006).

Additional health issues commonly coincide with SCI. These issues include respiratory disease, blood clots, bladder and urinary tract infections, high or low blood pressure, heart disease, osteoporosis, pressure ulcers, overuse upper extremity injuries, chronic pain,

Figure 1: ASIA scale

Source: http://www.asia-spinalinjury.org/elearning/ASIA_ISCOS_high.pdf

problematic bowel function, sleep

disorders, sexual disorders, suicides, fatigue, muscle spasms and atrophy, depression and/or respiratory infection. They can be persistent and can lead to emergency department visits, hospitalization, and even death (Guilcher et al. 2013, 894; Munce et al. 2013).

Myotomes / Voluntary Movement

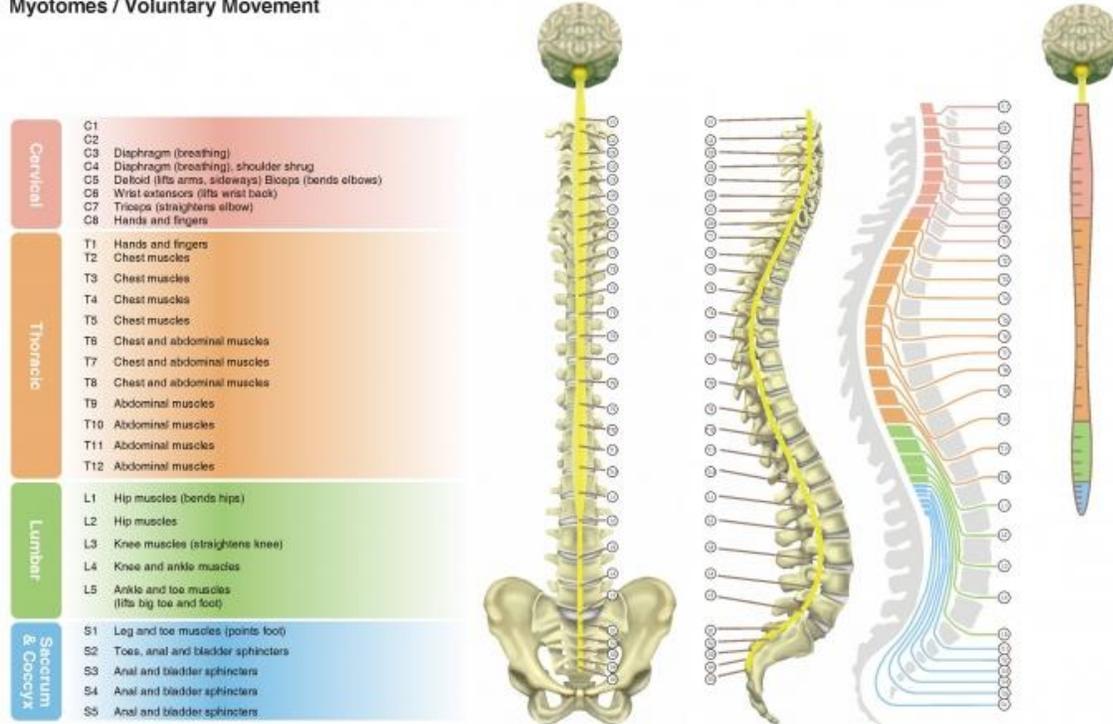


Figure 2: Location of injury along the spinal cord and resulting loss of motor function
 Source: <http://www.spinalhub.com.au/admin-resources/image-tools.php?w=700&h=700&c=0&e=0&q=98&src=/diagrams/12-15-myotomes-Spinal-illustr-G11100.jpg>

Healthcare Models for Treatment

Spinal Cord rehabilitation is seen as a “black box” (Wolfe, Hsieh, Mehta 2012, 2). Presumed permanence of injury is being replaced by neuro-rehabilitation theories that explore how nerves can be regenerated or re-educated to recover loss of function below the point of injury (Behrman, Bowden, and Nair 2006; Dobkins et al. 2003; Tansey 2010). Neural deterioration directly decreases muscle tone (Biering-Sørensen, Hansen, and Lee 2009), which is a causal factor in resulting medical treatment for fractures, spasticity, respiratory illness, and sub-lesional osteoporosis. Leading research facilitators such as the Christopher and Dana Reeves Foundation in the United States and the Rick Hansen Foundation in Canada are focusing a substantial portion of their research dollars on these emerging theories and their aligning practices. These include treatments that attempt to improve function below the point of injury and aim to reduce regression, improve gait and develop functional living skills among all SCI patients (Lam et al. 2014). More traditional methods, contrastingly, do not commence exercises for mobility progression until after the patient demonstrates capacity to make functional improvements.

Neuro-rehabilitation theorists are promoting a broader approach to treatment where, in the long term, patients who receive treatment beyond simple management of their level of injury

are seen to have the potential to recover loss of function not only below their point of injury, but also in the “soft” categories such as mental health, employment, and functionality in daily living. In fact, according to Wolfe, Hsieh and Mehta (2012), there is evidence that “a significant proportion of people” assessed as ASIA “B” or “C” will improve by at least one ASIA Impact Scale (AIS) grade with appropriate post-injury rehabilitation. Although fewer in number, these same results have also been seen in ASIA “A” patients. First Steps Wellness Center (FSWC) has designed its rehabilitation practices according to these philosophies.

Costs of Spinal Cord Injury (SCI)

Cost assessments typically measure direct costs such as Emergency Medical Service (EMS); initial hospitalization; inpatient care for re-hospitalization and nursing home stays; healthcare practitioner costs including outpatient therapy and long-term attendant care; equipment and supplies for daily living purposes and mobility; and medical equipment and supplies for secondary conditions (Krueger et al. 2013; Munce et al. 2013). Indirect costs include management of mental health such as medications, physician care, and psychologist care, and loss of work for the patient. Further extension of indirect costs includes similar expenses for family member caregivers. Although recognized in research, these costs are very difficult to ascertain due to obvious difficulties in data collection and analysis and others (Munce et al. 2013). ASIA scale neurological outcomes or functional recovery has therefore been shown to be “substantially associated with direct costs of healthcare utilization in traumatic SCI... [and that] rehabilitation costs after index discharge constitutes the largest proportion (58%) of healthcare costs” (Munce et al. 2013, 69). The next largest category is that of acute care inpatient readmission due to secondary complications. Indirect costs are likewise encountered as a result of spinal cord injuries such as loss of wages and productivity, family member caregiver work absences, or mental healthcare for the patient or family caregivers. Improving current care practices in managing these secondary complications would then lead not only to improved quality of life, but significant cost savings in healthcare provision (Munce et al. 2013, 68).

The medical costs associated with SCI vary greatly depending on the location and severity of injury. Actual dollar values also vary depending on the type of facility delivering the medical treatment. For instance, factors such as geographical location, length between injury and rehabilitation, level and location of injury, and types of costs used in calculations (type of facility, type of medical personnel included, in-patient versus out-patient, wage variability in regions and professions, inclusion of soft costs, etc.). However, it is possible to examine these expenses as they relate to each other as shown in Figure 3.

C1-4, ASIA ABC	Most significant level of impact in year one, and in each subsequent year
C 5-8 ASIA ABC	72% of costs incurred in year one of C 1-4 (reduction of 28%)
	61% of costs incurred each subsequent year of C 1-4 (reduction of 39%)

T1-S5 ASIA ABC	49% of year one compared to C 1-4 (reduction of 51%)
	37% of subsequent years compared to C 1-4 (reduction of 63%)
ASIA D	33% of year one compared to C 1-4 (reduction of 67%)
	23% of subsequent years compared to C 1-4 (reduction of 77%)

Figure 3: Relationship between medical cost and injury type

Source: Cao, Chen, and DeVivo 2011

Using Quebec data, Radhakrishna, Makriyianni, Marcoux, and Zhang (2014) concluded from their research that “measures taken to reduce the severity of [spinal cord] injury could result in significant cost savings” based on the higher healthcare costs of patients with more severe injuries who are more vulnerable to secondary health conditions that result in prolonged hospital stays (353). For example, they found that the cost of C1–C7 complete spinal cord injuries in the first year after injury was \$157,718 compared to the cost of an incomplete injury in the same region, which was \$56,505. Additional benefits can be seen beyond lower healthcare costs. Findings from a study by Riggins et al. (2011) demonstrated that therapies targeted at reducing the severity of SCIs can lead to a significantly lower incidence of depression and less severe pain after one year. Other studies have also associated severity of injury with quality of life, including a thesis that used data from Saskatchewan, and found that physical functioning, independence, physical well-being, and pain that increases limitations affect the quality of life of people with a quadriplegic injury more than those with a paraplegic one (Manns 1998; Manns and Chad 2001; Middleton, Tran, and Craig, 2007). An additional study found that those with less severe injuries may have a more satisfying sentimental life if their driving ability has been preserved and a more satisfying sexual life if they do not suffer from bladder incontinence (Sale et al. 2012). As for psychosocial adaptation, injury severity and impact was found to have a moderate indirect effect (Martz et al. 2005).

Rates of employment and participation in the labour force may also be impacted by SCI severity, as these tend to decline as the severity of a disability increases. For example, a Statistics Canada study (Till et al. 2015, 19) found that in 2011, 26 percent of Canadians with very severe disabilities were employed compared to 41 percent with severe disabilities and 65 percent of those with moderate disabilities. Another study on disability in Canada found that rates of employment remain unchanged despite level of education (Turcotte 2014, 4). The pattern of unemployment might have a number of causes including lower levels of active employment search among those with more severe disabilities; the inability to work altogether because of the nature of the disability (Till et al. 2015); or the increased likelihood of those with more severe disabilities to report having been refused a job as a result of their disability (Turcotte 2014).

Relatedly, the Statistics Canada study also found that income and ability to engage in everyday activities substantially decreased as the level of severity of disability increased. Canadians with mild disabilities had a median income of \$29,950, for those with moderate disabilities it was \$21,620, \$16,810 for those with severe disabilities, and \$14,390 for those with very severe

disabilities (Till et al. 2015, 20). Ability to use amenities was also compromised relative to the severity of the disability. For example, the Statistics Canada study showed that almost a third of people with very severe disabilities experienced a lot of difficulty using public or specialized transit compared to only 3 percent of those with mild disabilities (Till et al. 2015, 3). The Statistics Canada study also found that those with more severe disabilities were more likely to report needing something that they did not have, usually because fulfilling the need would be prohibitively expensive (Till et al. 2015, 22).

The families of people with more severe disabilities appear to be most susceptible to caregiver burden. According to a study by Weitzenkamp et al. (1997), situations where people have spinal cord injuries so severe that they depend on their spouse to act as their caregiver often result in depression and stress (i.e., caregiver burden) for that spouse. Indeed, they found that although depression was common among SCI patients, the levels of depression and stress felt by caregiver-spouses exceeded those felt by the patients. The burden might extend to those who help relatively independent SCI patients because people with disabilities who do not require caregivers often ask others for help with heavy household chores, especially family members but also friends, neighbours, or paid or unpaid individuals or organizations. Those with more severe disabilities ask for more help (Till et al. 2015, 23-24). If a disability is less severe, then less funding might be needed for respite workers and for caregiver healthcare. Caregivers and others who help people with spinal cord injuries might also be able to dedicate more hours to paid employment and other activities, and might be less burdened with providing help.

Benefits Provided by First Steps Wellness Center

The First Steps Wellness Centre (FSWC) is a non-profit organization located in Regina that provides rehabilitation services to clients with SCIs and other neurological health issues such as multiple sclerosis. Whereas rehabilitation organizations in Saskatchewan with government funding typically focus on strengthening their clients' neurological capacity above the point of injury and living with disability, FSWC promotes functional recovery – including functional gains below the point of injury – by using experience-based neuroplasticity principles (First Steps Wellness Centre n.d.). FSWC provides its clients with the possibility of a higher quality of life, higher income, lower costs to themselves and their family members, and fewer associated health issues and hospital visits. It also provides the possibility of financial savings to government.

Support for organizations like FSWC is found in the Saskatchewan Disability Strategy, which was released in June 2015 and includes a number of recommendations that were created jointly by the Citizen Consultation Team and the ministries of Social Services, Advanced Education, Economy, Education, Government Relations, Health, and Justice, and Corrections. It recommends that the province should “identify demand, examine gaps and seek opportunities to expand or redirect human services. Begin by addressing areas already shown to have significant gaps, including: Therapy providers...” (Citizen Consultation Team 2015, 31).

The Saskatchewan Disability Strategy's recommendation is reflected and elaborated in the Rick Hansen Institute's national Environmental Scan (Craven et al. 2012) entitled Capturing Capacity in Canadian SCI Rehabilitation (2012). The study was authored by leading spinal cord injury professionals across Canada, with support from the Rick Hansen Institute, Health Canada, The Ontario Ministry of Economic Development and Innovation, the Ontario Neurotrauma Foundation, and the Rick Hansen Foundation. The framework within this document presents 37 goals of rehabilitation practice in three distinct categories, with best practices expanded for one third of these.

The Environmental Scan (Craven et al. 2012) recommended, among other items, that there be an increase in the linkages between SCI rehabilitation and community service providers, and that effort should be made to train rehabilitation providers on how to be effective "agents of change" with individuals (e.g., incorporate a health-promotional perspective within their practice). In addition, it suggested that access to provincially-funded community rehabilitation service providers who act as "extenders" to physician, nursing, and physical and occupational therapy providers could prevent the cascade of secondary health conditions that plague individuals living in the community, and provide a cost-effective means of serving these individuals. In a subsequent publication, "A Manifesto for Change" (Craven et al. 2014), the institute put forth major recommendations, one of which is to invest in specialty outpatient rehabilitation services to markedly reduce the number of inappropriate SCI-related ER visits and unnecessary hospital admissions for pressure ulcers, fractures, and cardiovascular disease.

The equipment and practices utilized at FSWC aligns with many of the best practices established by the Manifesto for Change (Craven et al. 2014). Further, the Environmental Scan presents research evidence to help rehabilitation providers select best practices for SCI patients (Craven, et al. 2012). Evidence in this report is rated as level 1, 2, 3 or 4. Level 1 evidence is the highest rating, and means that there is evidence from at least one properly designed randomized control trial. Level 2 involves a lower randomized control, prospective controlled trial or cohort design. Lower levels include case controls, case reviews, pre-post and retrospective designs (Spinal Cord Injury Research Evidence, 2010). There is Level 1 evidence that the following FSWC practices are connected to a range of benefits:

- Functional Electrical Simulation (FES) systems
- LiteGait® body weight supported gait trainer
- Keiser Rack® pneumatic strength columns that assist in load bearing exercises
- Evolve® Standing Frames that provide passive standing support
- Total Gym® load bearing system with a closed platform
- Aerobic and functional exercise
- Manual manipulation techniques.
- Power Plate® multi-plane body vibration therapy
- Biosway® Balance System

The benefits associated with the practices as demonstrated by Level 1 evidence in the Environmental Scan (Craven et al. 2012) are listed below.

Neuropathic Pain Relief

Abnormal pain sensation with no identifiable root cause. Pain impacts physical and emotional domains, and neuropathic pain is particularly difficult to control. Two-thirds of SCI patients develop chronic pain of this nature resulting in sustained medication use, social isolation, depression and reduced employment opportunities (Craven et al. 2012, 107).

Increased Walking Ability

The ability to move over ground in an upright position while controlling balance, trunk and lower-limb sensation. This is often the primary goal reported by Canadian patients (Craven et al. 2012, 47). Walking assessments are varied and inconsistent across rehabilitation institutes. Generally speaking, about 50% of SCI patients have some ability to walk at discharge but most continue to develop skills for the next 18 months. Therefore, the first two years are seen as critical rehabilitation windows for walking.

Increased Ability to Breathe Independently

Independence in breathing after SCI prevents weakness of respiratory muscles (diaphragm and abdominal cavity), and includes muscles for speech, swallowing and clearing secretions. SCI patients can be at high risk for respiratory problems requiring subsequent hospitalization.

Reduced Pressure Ulcers

An immobile body is vulnerable to painful and infection-prone pressure ulcers where constant contact or pressure occurs, especially in bony areas.

Prevention of Sublesional Osteoporosis (SLOP)

SLOP occurs as bone density in SCI patients deteriorates. The Environmental Scan addresses the fact that shortened therapies and insufficient mechanical stresses may result in reduced efficacy of these interventions; sustained progress can only occur with sustained treatment so these therapies should remain in place for the lifetime of the patient (Craven et al. 2012, 120).

Reduced Spasticity

Abnormal increases in muscle tone and or stiffness can lead to spastic movements, pain, and interference in daily living activities, and if untreated, to fixed joints and injuries (Craven et al. 2012, 93). Dependence on pain medication may also occur.

Increased Emotional Wellbeing

This is an expansive category where the individual recognizes his or her own abilities, can cope with everyday experiences, has enhanced self-esteem and self-advocacy, and contributes to his or her community. Depression and anxiety are the hallmarks of unhealthy emotional states. Broad recommendations in the report are facilitated by FSWC practices, including the inclusion of family members and caregivers in the therapeutic environment.

All treatment of spinal cord injury that demonstrates progress toward patient goals has been shown to also impact emotional wellbeing. This internal belief is a driving factor for healthy recovery (Craven et al. 2012, p. 103). Exercise in general is well documented for its impact on endorphins, serotonin, and other mood-elevating hormones (Nabkasorn et al. 2005).

In addition to the research-evidenced benefits listed above, FSWC patients who experience improvement in any of the key areas may also demonstrate improvement in other domains mentioned in the Environmental Scan (Craven et al. 2012), including: independent eating, dressing and bathing; independent transfers; community mobility; independent activities of daily living; physical health; parenting; employment and vocation; recreation and leisure; self-management; general community participation.

Cost of Rehabilitation

Although official costs could not be obtained, it is estimated by FSWC executives that in Saskatchewan, the cost of general hospitalization is approximately \$1,800 per day, and at Wascana Rehabilitation Center (WRC) the cost is much higher, at \$2,700-\$3,000 per day, or between \$60,000-\$90,000 per month. These numbers align well with an Ontario study of direct costs of health services, which reports that the average first-year per-person cost of inpatient rehabilitation was \$119,945 for traumatic SCI (2005/06) (Cao, Chen and DeVivo 2011), which assumes that the patient is hospitalized for 8-12 weeks (\$40,000-\$60,000 per month). Given that public healthcare costs currently post an annual growth of 5.2% (Brimacombe, Antunes, and McIntyre, 2001), we can estimate that this cost is currently approaching approximately \$200,000 per inpatient rehabilitation session (mean 90.2 days +/- 64.3 days).

These costs might be recovered or directly absorbed by the government or other organization, but it may be challenging or impossible to access some of the programs and services that ease the financial burden of SCI patients. The Saskatchewan Government Insurance (SGI) might cover many of the costs if the SCI occurred as a result of a motor vehicle accident or the Workers' Compensation Board (WCB) might if the injury occurred during a workplace accident. Otherwise, hospitalization and in-patient rehabilitation costs are absorbed by Saskatchewan Healthcare. Post-hospitalization, there is a need to pay ongoing medical, rehabilitation, and other costs. It can be challenging for patients to access funding for post-hospitalization expenses because patients might not meet eligibility and acceptance criteria of government services and funding programs (for a list of eligibility and acceptance criteria, see Government of Saskatchewan 2015; Saskatchewan Ministry of Health n.d.a, n.d.b, and n.d.c), they might

have difficulty transferring their case when changing residence to a different region within Saskatchewan, or they might encounter exhausting and repetitive screening when applying for multiple services or funding programs. Moreover, public services can be insufficient to meet patients' needs, and those who can afford to do so often complement them with private services that they pay for out-of-pocket (Martin-Matthews, Sims-Gould, and Tong 2013, 67).

As a result of these difficulties, SCI patients often do not sustain rehabilitation once they have been released from the hospital environment. According to Munce (2013), however, hospital readmission costs double when initial rehabilitation is shortened. Further to this is the previously cited evidence that rehabilitation should continue beyond initial hospitalization in order to maximize potential neuro-recovery. Neuro-recovery has the potential of reducing severity of injury and therefore substantially reducing ongoing healthcare costs while improving the individual's independence, community participation, and emotional wellbeing.

If a SCI patient were to receive their therapy in the community through a responsible transition from in-patient to out-patient at a selected rehabilitation provider, such as FSWC, for six to eleven hours a week, then the following cost breakdown would be required (FSWC provided numbers as of March 2016):

Rehabilitation	\$1,900-3,500 per month (based on FSWC rate of \$80/hour)
Caregiver	\$1,400-4,800 per month
Accommodations	\$1,700/month (accessible suite)
Food and other costs	\$1,000/month
Total range:	\$6,000-\$11,000 per month

The total cost for FSWC clients is \$72,000-\$132,000 per year compared to our estimate of \$200,000 using conventional inpatient rehabilitation services, whereby the length of each session is mean 90.3 days +/- 64.3 days. The disparity is likely much larger because the conventional services estimate excludes indirect health costs, secondary health conditions, and quality of life costs – all of which might be reduced using FSWC rehabilitation techniques – as well as daily living costs.

Recommendations

Direct financial support to FSWC

FSWC does not currently have government funding or support beyond that provided to all non-profit organizations. Despite limiting costs by, for example, employing qualified student health assistants and aides, it cannot charge less for its services. As discussed above, people with disabilities tend to have lower income than able-bodied people, so the fee is likely prohibitively high for many patients who would otherwise choose FSWC's rehabilitation services for their

neuro-recovery potential. FSWC might provide greater benefit to its clients compared with publicly funded rehabilitation options but, without government funding to subsidize costs, its services are unaffordable to many.

Formal acknowledgement that FSWC is a safe and effective option

People with disabilities in Saskatchewan are increasingly eligible for individualized funding, which is when disability services funding is directed towards people with disabilities to spend on the services they choose or to the services they explicitly choose (Lynch & Findlay, 2007; Saskatchewan Ministry of Finance, 2016; Saskatchewan Ministry of Social Services, 2015). This means that people with spinal cord injuries and other related impairments have increased access to private services, including the ones provided by FSWC. The Ministry of Social Services offers the most comprehensive individualized funding in the province through its Saskatchewan Assured Income for People with Disabilities (SAID) program, which is identified as a priority in the Saskatchewan budget (Saskatchewan Ministry of Finance 2016) and the Ministry of Social Services Plan 2015-16 (Saskatchewan Ministry of Social Services 2015). SAID facilitators are found at service centres throughout the province and they can help with application to the program and with decision-making about how to best use the income they might get from the program.

SAID is nascent and its pilot project has only recently been completed (Saskatchewan Ministry of Social Services 2015, 4), therefore direct funding to disability service organizations such as FSWC is still essential. That being said, other forms of support could be beneficial because recipients of individualized funding are confronted with increased logistical complexity to obtain services (Lord, John, and Peggy Hutchison 2008). Formal public support of organizations like FSWC could inform patients in their decision-making about the safe and effective therapy options available to them. For example, listing FSWC contact information on an easy to find official website would be effective, as would providing information about FSWC in a pamphlet available to SCI patients and families during initial hospitalization, and ensuring that SAID facilitators are aware of FSWC.

Conclusion

SCIs can affect anyone, regardless of age, gender, socio-economic status, or race. Its severity can vary according to type of injury (i.e., inflammation or damage to the spinal cord), location along the spinal cord, and functions that are lost or preserved as a result. Rehabilitation therapies that Saskatchewan residents can access without paying out-of-pocket focus on living with the injury and consider therapies to improve function only after capacity for recovery of function has been demonstrated. However, FSWC takes a different approach. Its exercises – whose effectiveness is supported by strong clinical research – tap into the neuroplasticity of the spinal cord below the point of injury to decrease the severity of disability and improve function. This means that it has potentially massive impact compared to other therapies. Not only might it improve the physical capacities of its SCI patients, but also patients' quality of life and future income, and it might decrease costs to themselves and family members, and reduce the

number of associated health issues and subsequent hospital visits. The province, in turn, benefits from related financial savings.

However, the cost of FSWC services can be prohibitively expensive. A number of provincial funding programs exist to help SCI patients cover their costs given their likely decreased income and increased expenses, but many of them have limited eligibility and acceptance, are not applicable to rehabilitation therapy, are not yet fully established, or do not adequately cover expenses. Therefore, we make two recommendations: 1) that FSWC be given direct funding so that it can reduce the cost paid to access its services, and 2) that FSWC be formally acknowledged as a safe and effective option for SCI patients with SAID funding to make informed decisions about their choice of therapy.

By following these recommendations, the Government of Saskatchewan can expect long-term financial savings from fewer hospitalizations, fewer medications and physician visits for secondary health concerns, and in-home caregiving costs.

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Appendix 1: ASIA spinal cord injury classification

Source: American Spinal Injury Association & International Spinal Cord Society. (n.d.). International Standards For Neurological Classification of Spinal Cord Injury (ISNCSCI) [assessment diagram]. Retrieved from http://www.asia-spinalinjury.org/elearning/ASIA_ISCOS_high.pdf

Muscle Function Grading

- 0** = total paralysis
- 1** = palpable or visible contraction
- 2** = active movement, full range of motion (ROM) with gravity eliminated
- 3** = active movement, full ROM against gravity
- 4** = active movement, full ROM against gravity and moderate resistance in a muscle specific position
- 5** = (normal) active movement, full ROM against gravity and full resistance in a functional muscle position expected from an otherwise unimpaired person
- 5*** = (normal) active movement, full ROM against gravity and sufficient resistance to be considered normal if identified inhibiting factors (i.e. pain, disuse) were not present
- NT** = not testable (i.e. due to immobilization, severe pain such that the patient cannot be graded, amputation of limb, or contracture of > 50% of the normal range of motion)

Sensory Grading

- 0** = Absent
- 1** = Altered, either decreased/impaired sensation or hypersensitivity
- 2** = Normal
- NT** = Not testable

Non Key Muscle Functions (optional)

May be used to assign a motor level to differentiate AIS B vs. C

Movement	Root level
Shoulder: Flexion, extension, abduction, adduction, internal and external rotation	C5
Elbow: Supination	
Elbow: Pronation	C6
Wrist: Flexion	
Finger: Flexion at proximal joint, extension.	C7
Thumb: Flexion, extension and abduction in plane of thumb	
Finger: Flexion at MCP joint	C8
Thumb: Opposition, adduction and abduction perpendicular to palm	
Finger: Abduction of the index finger	T1
Hip: Adduction	L2
Hip: External rotation	L3
Hip: Extension, abduction, internal rotation	L4
Knee: Flexion	
Ankle: Inversion and eversion	
Toe: MP and IP extension	
Hallux and Toe: DIP and PIP flexion and abduction	L5
Hallux: Adduction	S1

ASIA Impairment Scale (AIS)

A = Complete. No sensory or motor function is preserved in the sacral segments S4-5.

B = Sensory Incomplete. Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-5 (light touch or pin prick at S4-5 or deep anal pressure) AND no motor function is preserved more than three levels below the motor level on either side of the body.

C = Motor Incomplete. Motor function is preserved below the neurological level**, and more than half of key muscle functions below the neurological level of injury (NLI) have a muscle grade less than 3 (Grades 0-2).

D = Motor Incomplete. Motor function is preserved below the neurological level**, and at least half (half or more) of key muscle functions below the NLI have a muscle grade ≥ 3 .

E = Normal. If sensation and motor function as tested with the ISNCSCI are graded as normal in all segments, and the patient had prior deficits, then the AIS grade is E. Someone without an initial SCI does not receive an AIS grade.

** For an individual to receive a grade of C or D, i.e. motor incomplete status, they must have either (1) voluntary anal sphincter contraction or (2) sacral sensory sparing with sparing of motor function more than three levels below the motor level for that side of the body. The International Standards at this time allows even non-key muscle function more than 3 levels below the motor level to be used in determining motor incomplete status (AIS B versus C).

NOTE: When assessing the extent of motor sparing below the level for distinguishing between AIS B and C, the **motor level** on each side is used; whereas to differentiate between AIS C and D (based on proportion of key muscle functions with strength grade 3 or greater) the **neurological level of injury** is used.


 AMERICAN SPINAL INJURY ASSOCIATION
INTERNATIONAL STANDARDS FOR NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY


 INTERNATIONAL SPINAL CORD SOCIETY

Steps in Classification

The following order is recommended for determining the classification of individuals with SCI.

1. Determine sensory levels for right and left sides.

The sensory level is the most caudal, intact dermatome for both pin prick and light touch sensation.

2. Determine motor levels for right and left sides.

Defined by the lowest key muscle function that has a grade of at least 3 (on supine testing), providing the key muscle functions represented by segments above that level are judged to be intact (graded as a 5).

Note: in regions where there is no myotome to test, the motor level is presumed to be the same as the sensory level, if testable motor function above that level is also normal.

3. Determine the neurological level of injury (NLI)

This refers to the most caudal segment of the cord with intact sensation and antigravity (3 or more) muscle function strength, provided that there is normal (intact) sensory and motor function rostrally respectively.

The NLI is the most cephalad of the sensory and motor levels determined in steps 1 and 2.

4. Determine whether the injury is Complete or Incomplete.

(i.e. absence or presence of sacral sparing)

*If voluntary anal contraction = **No** AND all S4-5 sensory scores = 0 AND deep anal pressure = **No**, then injury is **Complete**.*

*Otherwise, injury is **Incomplete**.*

5. Determine ASIA Impairment Scale (AIS) Grade:

Is injury **Complete**?

If YES, AIS=A and can record

ZPP (lowest dermatome or myotome on each side with some preservation)

NO



Is injury **Motor Complete**?

If YES, AIS=B

NO



(No=voluntary anal contraction OR motor function more than three levels below the motor level on a given side, if the patient has sensory incomplete classification)

Are at least half (half or more) of the key muscles below the neurological level of injury graded 3 or better?

NO



AIS=C

YES



AIS=D

If sensation and motor function is normal in all segments, AIS=E

Note: AIS E is used in follow-up testing when an individual with a documented SCI has recovered normal function. If at initial testing no deficits are found, the individual is neurologically intact; the ASIA Impairment Scale does not apply.