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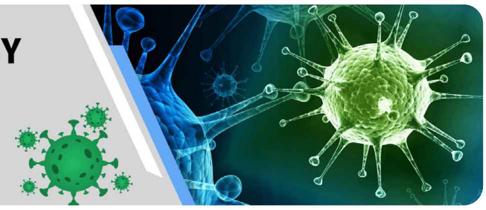

Evaluation of Functional Improvement and Community Integration Status among Persons with Spinal Cord Injury after a One-Year Follow-Up in the Community

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Abstract

Objective: This study compared functional improvement and community integration status among people with spinal cord injury at hospital discharge and after 1 year of follow-up in the community.

Methods: A longitudinal cohort–study design was used in which a total of two hundred patients with spinal cord injury completed demographic and medical questionnaires and underwent a medical examination at discharge from a hospital rehabilitation department; among them, one hundred and sixty-eight patients attended a 1-year follow-up in the community. The Spinal Cord Independence Measure (SCIM) and Community Integration Questionnaire (CIQ) were used to assess functional improvement and community integration status over this period.

Results: The median age of the participants was 32 years (25 to 45). A significant association was found between the severity of spinal cord injury and the severity of skeletal nerve injury. According to the Spinal Cord Independence Measure (SCIM), functional improvement status significantly increased ($p < 0.05$) from the time of discharge to the time of stay in the community. After discharge, nearly half of the patients developed a new pressure sore, and most patients experienced urinary complications. The social participation (i.e., community and home integration) results also showed a significant improvement ($p < 0.05$) while staying in the community.

Conclusion: This study examined the functional status and community integration of people with spinal cord injuries (SCIs) after one year of rehabilitation. The results show improvements in functional status, general health, and satisfaction with social relationships. However, medical complications, depression, cognitive function decline, and re-employment are still prevalent. The study suggested that rehabilitation should include emotional and cognitive functions, as well as re-employment, to achieve greater community integration. Clinicians can assist patients by providing resources, teaching self-care, emergency management, freehand exercise, and community participation.

Keywords: Spinal cord injury, Community, Rehabilitation, Exercise

Introduction

Spinal cord injury (SCI) is a life-threatening event that can have a significant impact on an individual's functional status and ability to integrate into their community.[1] According to the National Spinal Cord Injury Statistical Center, an estimated 17,730 new SCI cases occur each year in the United States, with the majority of individuals between the ages of 16 and 30.[2] The physical, emotional and social effects of SCI can be overwhelming and long-lasting,[3] and the transition from hospital to the community can be difficult.[4] A recent study conducted at a hospital analyzed the functional status and community integration of persons with SCI at the time of hospital discharge and one year later in the community.[5] Another study included a sample of 100 individuals who had sustained an SCI and had been discharged from the hospital within the past six months.[6] The participants were assessed for functional status using the Functional Independence Measure (FIM) and for community integration using the Craig Handicap Assessment and Reporting Technique (CHART).[7] The FIM is a widely used measure of functional status that assesses an individual's ability to perform activities of daily living (ADLs), such as bathing, dressing, and toileting.[8] The CHART, on the other hand, is a community integration measure that assesses an individual's ability to participate in leisure, social, and vocational activities.[9]

The results of one study showed that at the time of hospital discharge, the majority of participants had moderate to severe functional limitations and limited community integration.[10] One year later, there was a significant improvement in functional status, with more than half of the participants achieving independence in ADLs.[11] However, community integration has remained a significant challenge for many participants, with only a tiny percentage reporting full participation in leisure, social, and vocational activities.[12] Another study highlights the ongoing challenges individuals face with SCI as they transition from hospital to community.[13] This highlights the need for ongoing support and resources in the community to assist individuals with SCI in achieving their full potential.[14] Rehabilitation professionals, family members, and community leaders must work together to provide the necessary support and resources to help individuals with SCI achieve the highest level of community integration possible.[15] Additionally, a study highlighted the importance of early intervention and rehabilitation for individuals with SCI.[16] Early intervention and rehabilitation can help individuals with SCI achieve the highest possible functional status and community integration.[17] It can also help to mitigate the physical, emotional, and social effects of SCI and improve overall quality of life.[18] It is also important to note that many studies had small sample sizes, and further research is needed to confirm the findings. Larger studies that include a more diverse population of individuals with SCI and that also examine the long-term effects of SCI on functional status and community integration are needed to fully understand the challenges and needs of individuals with SCI in the community.

Methods

Design

This prospective cohort study measured variables of interest related to changes in functional status and community integration after returning to the community. Measurements were performed at discharge immediately after rehabilitation therapy (from August 2020 to April 2021) and at one year of follow-up (from September to December 2022).

Subjects

A total of 200 spinal cord injury (SCI) survivors who sustained their injuries and were admitted to the SCI rehabilitation unit of the Centre for the Rehabilitation of the Paralysed (CRP) from August 2020 to April 2021 were identified and enrolled. The eligibility criteria were as follows: (i) 18 years of age or older, (ii) male or female, (iii) had been rehabilitated at the CRP, (iv) lived in a community close to the CRP, and (v) willing to participate voluntarily. The exclusion criteria were (i) SCI with traumatic brain injury and/or fractures of the extremities and (ii) inability to complete the questionnaires and clinical assessment instruments. A total of 200 patients were included in the study group at baseline, but 168 patients were included in the follow-up group, with very good compliance. This study was approved by the ethics committee of the Centre for the Rehabilitation of the Paralyzed (CRP) (CRP-R&E-0401-334), and written informed consent was obtained from all participants.

Demographic information

Gender, age, marital status, educational level, employment and annual family income were assessed. Clinical factors such as the type of injury, complications that arise while the patients are in the community, and the ASIA impairment scale (AIS) score of the patients were also recorded.

Functional status evaluation

The spinal cord independence measure (SCIM) is a popular tool for evaluating how well people with spinal cord injuries function in everyday life activities. This scale consists of 19 daily task-related items arranged into three domains: mobility (9 items, scores ranging from 0-40), respiration and sphincter management (4 items, scores ranging from 0-40), and self-care (6 items, scores ranging from 0-20). A person's overall SCIM score can vary from 0 to 100, with higher scores representing better levels of competence or independence.[19]

Community integration

The Community Integration Questionnaire (CIQ) determines how connected people are to their communities. It provides a measure of social role limitations and community

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interactions. It contains 15 items assessing community integration across three domains: home integration (scores range from 0-10 and questions related to activities such as meal preparation, housework, and childcare); social integration (scores range from 1-12 points and questions related to activities such as shopping, visiting friends, and leisure activities); and productive activity (scores range from 0-7 points and questions related to activities such as work, education, and volunteer activities).[20] A person's overall CIQ score can vary from 0 to 29 points. For this study, only the domains of home integration and social interaction were used; hence, the overall score varied from 0 to 22 points. It was decided not to include the productive activity domain because it did not match our study objectives. Higher scores indicate greater independence and community integration.

Complications

All participants underwent a monthly medical examination to assess for complications, including bladder dysfunction (including neurogenic bladder, urinary tract infection and bladder stones), renal dysfunction, heterotopic ossification and pressure sores.

Statistical analysis

Microsoft Excel was used for data entry by trained coders, and analyses were performed with SPSS 25.0. Distributed continuous variables are described as the mean value (standard deviation (SD)), and categorical variables are described as the frequency distribution. All continuous variables with a normal distribution were tested by the Kolmogorov–Smirnov test. Comparisons of functional status and community integration at discharge and one year later were compared with the Wilcoxon signed-rank test, depending on the distribution of the outcomes. The alpha error level was fixed at $p \leq 0.05$.

Results

Participant demographics

Among the 200 participants at discharge, 168 participated in a one-year follow-up measurement of functional status and community integration in the community. The median age of the participants was 32 years (25 to 45), and 51.2% (n=86) of the total participants were younger than 35 years. Most of the participants were male (88.1%, n=148), and most were married or unemployed (72.0%, n=121; 74.4%, n=125). Thoracic level injuries (48.2%, n=81) and paraplegic spinal cord injuries (64.9%, n=109) were the most common (Table 1).

Medical complications

At the 1-year follow-up in the neighborhoods, 39.9% (n=67) of the patients reported spasmodic pain and had experienced this pain nonstop since discharge. A total of 32.3% (n=54) of the population had a new pressure sore,

Table 1: Sociodemographic and clinical characteristics of the participants

Demographic	% (n)	Demographic	% (n)	Clinical Characteristics	% (n)
Age		Marital status		Skeletal level	
Median (IQR)	32 (25 to 45)	Married	72.0 (121)	Cervical	32.7 (55)
< 35 years	51.2 (86)	Unmarried	22.6 (28)	Thoracic	48.2 (81)
≥ 35 years	48.8 (82)	Divorced/Separated	9 (5.4)	Lumber	19.0 (32)
Gender		Employment		Type of injury	
Male	88.1 (148)	Employed	25.6 (43)	Paraplegic	64.9 (109)
Female	11.9 (20)	Unemployed	74.4 (125)	Tetraplegic	35.1 (59)

Table 2: Medical complications

Complications	Skeletal level			% (n)	Pearson Chi-Square test	p
	Cervical	Thoracic	Lumbar		(χ2)	
Pain	21	34	12	39.9 (67)	11.647	0.31
Pressure sore	21	26	7	32.1 (54)		
Neurogenic bladder	8	7	4	11.3 (19)		
Urinary tract infections	3	5	6	8.3 (14)		
Bladder stone	2	7	3	7.1 (12)		
Heterotopic ossification	0	2	0	1.2 (2)		

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11.3% (n=19) had neurogenic bladder, and 8.3% (n=14) had at least one urinary tract infection. Two patients with heterotopic ossification and twelve patients with bladder stones were both diagnosed (Table 2).

Level and severity of spinal cord injury (AIS)

Among the participants, sixty percent (n=101) had complete ASCI. There was a significant association between the skeletal level of injury and the severity of spinal cord injury (AIS) ($p < 0.05$). Therefore, the skeletal level of injury has a significant impact on the severity of spinal cord injury (Table 3).

Functional status

Compared with the scores at discharge from primary rehabilitation, the spinal cord independence measure (SCIM) scores increased significantly ($p<0.05$), indicating that functional levels improved upon returning to the community.

Community integration/Social participation

The total scores of the community integration questionnaire at 1 year in the community were significantly greater than those at discharge. The participants improved significantly in terms of home and social integration after staying in the community for one year ($p < 0.05$).

Discussion

We analyzed the medical complications, functional status, and community integration of 168 patients with SCI at discharge from the spinal cord injury rehabilitation unit of the Centre for the Rehabilitation of the Paralyzed (CRP) and at the 1-year follow-up in the community. Our study investigated functional status and community integration in people with spinal cord injury after one year of follow-up in a community setting. These included typical secondary chronic complications after SCI, such as urinary dysfunction, neuropathic pain and pressure sores, the latter of which accounted for most secondary admissions. The median age of the participants in this study was 32 (25 to 45), and 51.2% (n=86) of the total participants were under the age of 35. The majority of the participants were male (88.1%, n=148), and most were married or unemployed (72.0%, n=121; 74.4%, n=125). Thoracic level injury (48.2%, n=81) and paraplegic spinal cord injury (64.9%, n=109) were the most common injuries among the participants. A study conducted in China showed that the subjects had a mean age of 52.6 years (SD 15.8), ranging from 20–79 years. The male:female ratio was approximately 0.7:1 (n = 11 and 15, respectively). Sixty-nine percent (n = 18) were married, and 30.8% (n = 8) were single (1 spouse died from the earthquake, 3 spouses died for other reasons).[21]

Table 3: Level and severity of spinal cord injury (AIS)

Level of Spinal cord injury (AIS)	Skeletal level			% (n)	Pearson Chi-Square test	p
	Cervical	Thoracic	Lumbar		(χ2)	
Complete A	27	59	15	60.1 (101)	13.214	0.04*
Incomplete B	7	8	3	10.7 (18)		
Incomplete C	10	7	5	13.1 (22)		
Incomplete D	11	7	9	16.1 (27)		

Table 4: Functional status

	At discharge	In community	p
	Median (IQR)	Median (IQR)	
Spinal Cord Independence Measure (SCIM) score	22 (17 to 26)	53 (47 to 59)	0.001*

Table 5: Community integration

Community integration	At discharge	In community	p
	Median (IQR)	Median (IQR)	
Home integration	5 (3 to 7)	9 (7 to 10)	0.001*
Social integration	6 (5 to 8)	8 (7 to 11)	0.001*

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Among the participants, sixty percent (n=101) had complete ASCI. The P value for the skeletal level of injury and severity of spinal cord injury (AIS) was 0.040. Therefore, the skeletal level of injury has a significant impact on the severity of spinal cord injury. Among the 30 participants recruited for the present study, 10 were classified as tetraplegia ASIA A/B/C, whereas 7 were classified as paraplegia ASIA A/B/C. Seven and six participants were classified under the tetraplegia and paraplegia ASIA D groups, respectively. In the tetraplegia A/B/C group, significant differences were obtained only between the admission and discharge scores (F (1,9) = 15.56; $P < 0.01$). In the paraplegia A/B/C group, significant functional improvements were shown not only during the hospitalization period (F (1,6) = 35.94; $P < 0.01$) but also 1 month after discharge from the SCI center (F (1,6) = 6.56, $P < 0.05$). For both the tetraplegia and paraplegia ASIA D groups, the participants showed improvements in FIM motor scores during the hospitalization period and between the 6th month and 12th month ($P < 0.05$).[22] A total of 39.9% (n=67) of the patients reported spasmodic pain and had experienced this pain nonstop since discharge. A total of 32.3% (n=54) of the population had a new pressure sore, 11.3% (n=19) had neurogenic bladder, and 8.3% (n=14) had at least one urinary tract infection. Two patients with heterotopic ossification and twelve patients with bladder stones were both diagnosed. One study showed that at the 1-year follow-up in the community, all patients experienced spasmodic pain along the course of one or more nerves, and some reported constant pain since discharge. Forty-six percent (n = 12) had a new pressure sore, 53.8% (n = 14) had a neurogenic bladder, and 57.7% (n = 15) had a urinary tract infection (UTI) at least once. Two patients with bladder stones and one patient with heterotopic ossification (HO) were diagnosed. Secondary complications may also negatively affect QoL and community integration. Clean intermittent catheterization, transurethral catheterization and suprapubic cystectomy have been reported as poor methods of bladder management in terms of QoL due to the associated high frequency of incontinence.[23]

The spinal cord independence measure (SCIM) scores were strongly significantly different (p 0.001) from the scores at discharge from primary rehabilitation, indicating that functional levels improved upon returning to the community. Compared with the data at discharge from primary rehabilitation, the MBI (p 0.002) and WISCI II (p 0.000) scores increased significantly, indicating that ADLs and walking improved upon returning to the community. Pain and depressive symptoms decreased insignificantly (Table IV); however, 26.9% (n=7) required antidepressant treatment, and 53.8% (n=15) required psychological counseling.[21] Another study suggested that SCI patients who were independently ambulatory had a greater chance of failing to walk over obstacles.[24] Thus, rehabilitation procedures should incorporate contextual conditions similar to those of the community environment to minimize the risk of falling and prepare individuals to be more independent. After spinal cord injury, people who participate in regular physical activity—a wheelchair rugby—have better relationships with better fitness, greater independence and better functional status.[25]

In our study, there were significantly more community integration questionnaires at 1 year in the community than at discharge. The participants markedly improved in terms of home and social integration after staying in the community for one year ($p < 0.05$). One study showed that the total CHART-SF score at 1 year in the community was greater than that at discharge (not significant). The physical independence and mobility scores increased significantly ($p < 0.05$), while the cognitive independence score decreased significantly ($p < 0.05$). No statistically meaningful differences were identified in occupation or actual social integration, i.e., the ability to participate in and maintain customary social relationships.[21] These findings indicate a general decline in community reintegration in terms of physical independence, mobility, occupation and social integration. Mobility issues were the most significant perceived barrier, and economic issues also significantly influenced community participation.[26] Functional deficits in SCI patients may result in obstacles that result in limited participation in social activities, thereby impeding community integration. Greater social participation results in increased community inclusion, which, in turn, may improve patients' feelings of self-worth, confidence, and vocational potential.[27] Another study showed that community reintegration achieved by individuals with traumatic spinal cord injury (TSCI) is generally low. Individuals' perceptions about community reintegration are affected by the community in which they live. Self-efficacy plays a major role in community reintegration following a TSCI. However, reintegration is largely dependent on social functioning rather than the activity of daily living factors of self-efficacy.[28] A systemic review revealed that there were more barriers in the form of health-related issues, personal and environmental issues, and psychological and social issues that hinder community reintegration among individuals with spinal cord injury than among facilitators. Most studies have identified special challenges related to the environment in terms of the accessibility of home and public buildings and transportation. Removing barriers related to health, the environment, and psychological and social factors can enhance community reintegration of such patients.[29]

Conclusion

The current study highlighted the functional status and community integration of people with different levels and severities of SCI after they had been discharged from a rehabilitation center for 1 year. Dimensions of functional status, including ADLs and walking, improved significantly after one year, as did general health and satisfaction with social relationships; areas of community integration, including physical independence and mobility, also improved significantly. However, medical complications increased, a high incidence of depression persisted, cognitive function significantly decreased, and only a low percentage of SCI survivors returned to work. Therefore, the need for the rehabilitation of SCI patients should be addressed, in addition to physical rehabilitation programming, which more fully addresses emotional and cognitive function as well as re-employment, to achieve greater community integration. After they reintegrated into the community, people with SCI still needed to adapt to a new daily routine with their new physical conditions. In addition, they also needed to face physical complications and psychological distress. To facilitate their integration into the community in a smoother manner and to adopt a more productive life role, clinicians could serve as resource personnel whenever they encounter difficulties in their daily routine. These patients need to be followed up at intervals so that they can know about their health status and other problems they are facing. Before going to their home from the hospital, they must teach about self-care, emergency management (catheterization, skin care, side changes after 2 hours or in regular intervals, and when they stay in a wheelchair, they must perform lift after 20/30 minutes), free-hand exercise, and participation in the community.

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