

Original Article

Occupational therapy treatment time during inpatient traumatic spinal cord injury rehabilitation: A retrospective study from a tertiary center in Riyadh

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Abstract

Background

Occupational therapy (OT) is a part of the rehabilitation process which facilitates and enables individuals with spinal cord injuries (SCI) to be as independent as possible in their activities of daily living (ADLs). Little is known about the OT treatment plan and the duration of the selected treatment intervention during SCI rehabilitation. This study aims to describe the duration of OT treatment that patients with SCI Received during their inpatient rehabilitation stay.

Materials and Methods

A chart review of patients with SCI who attended inpatient rehabilitation at King Abdulaziz Medical City between 2016 and 2020 was conducted. The documented rehabilitation session, including the treatment duration and the type of therapeutic intervention, were extracted from each patient's electronic medical file.

Results

A total of 50 eligible patients have been included in this analysis. The median age of the study population was 28, and the majority were male patients (82%). The most common reason for the SCI was a motor vehicle accident (94%), in which 56% required ICU admission. The median total time spent over the patient's stay was 1785 min, approximately 43.7 hr of OT rehabilitation.

Conclusion

Differentiation between and within traumatic SCI patient level in the length of stay (LOS). Differentiation in time intensity was explained by patient and injury characteristics. Also, we identified a significant variation in time spent among traumatic SCI for all OT interventions when examining the median of the total number of hours. Specifically, we found that lower body dressing training was the most time-consuming ADL.

Keywords: *Occupational therapy, Activity of daily living, Traumatic spinal cord injury, Range of motion, Length of stay.*

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1. Introduction

Occupational therapy (OT) is a part of the rehabilitation process which facilitates and enables individuals with spinal cord injuries (SCI) to be as independent as possible in their activities of daily living (ADLs) (1, 2). OT practitioners have the knowledge and skill to evaluate and address the physical, cognitive, and psychosocial aspects that influence an individual's ability to carry out ADLs (3, 4). Looking at these aspects would help OT practitioners break down the activity into small components and adapt it to meet the level of impairment of individuals with SCI, which would allow an efficient and full engagement in ADLs (5, 6). Few studies in the Middle East have reported factors that impact the OT treatment plan and the amount of time spent selecting the treatment intervention during SCI rehabilitation stays (7). OT practitioners have to match the interventions, techniques, and assistive devices prescribed with the severity of the injury (8, 9). A study conducted to find the OT treatment time during inpatient SCI rehabilitation in USA in 2011 estimated that 600 SCI patients Received a mean total of 52 hr of OT throughout their rehabilitation stay. Also, they found OTs spend significantly more time working with patients who have C5–8 SCI than patients with other injury levels (10). In 2015, Nas et al. Published: a study on the rehabilitation of SCI. They found a strong relationship between functional status and the completeness of the injury, and the level of the injury. Also, SCI rehabilitation is a long process that requires patience and encouragement from patients and relatives. Early rehabilitation is essential to prevent joint contractures and the loss of muscle strength, conservation of bone density, and to ensure normal functioning of the respiratory and digestive system (11). In addition, Ozellie et al. in 2012 studied the relationship between OT inpatient rehabilitation interventions and patient characteristics to outcomes following SCI: The

SCIREhab Project. They estimated that 1032 patients Received one or more OT treatment sessions during rehabilitation. Six treatments were provided in that study, and patients Received a mean total of 53.8 hr of OT during their stay (12). Compliance with participation in the activity and the amount of time spent during the activity should also be considered (13, 14). Therefore, our study aims to estimate the time and interventions of OT needed for patients with traumatic spinal cord injury (TSCI) during inpatient rehabilitation, identify the factors that impact the treatment plan, and compare the patient's independency between admission and discharge by measuring the differences in ADLs performance.

2. Materials and Methods

A retrospective chart review was conducted at King Abdulaziz Medical Center in Riyadh between January 2016 and December 2020. Adult patients who had a clinical diagnosis of TSCI were identified from the medical records. Demographic variables, SCI level, mechanism of injury, OT interventions in ICU, OT interventions in the general ward, treatment time, equipment, American Spinal Injury Association (ASIA) impairment score, date of injury, surgery and OT referral, and length of stay (LOS) were collected from each patient's medical record. The inclusion criteria were all patients aged 15 and above with TSCI who attended inpatient OT sessions as part of the multidisciplinary treatment at King Abdulaziz Medical City (KAMC). Patients with non-TSCI such as oncology, infectious or degenerative etiologies, and outpatient OT management were excluded from the study. A total of 50 participants constituted the sample of this study. In the OT department – inpatient care – data were provided upon IRB approval. Next, data were entered in Microsoft Excel and then exported to the SPSS. The data (categorical variables) were then presented as frequencies and percentages. For continuous variables, mean and standard deviation

were used to describe the variables, if normally distributed; otherwise, the median and IQR were used. The OT time and intervention needed for patients with TSCI during inpatient rehabilitation were calculated by patient variables.

3. Results

3.1. Patient demographics

A total of 50 eligible patients with TSCI were included in this analysis. The median age of the study participants was 28 years. Of the included patients, 82% were male, 65% single, and 68% non-smokers. The cause of a TSCI for 94% was motor vehicle accident, 56% of which required ICU admission during their hospital stay. Moreover, 58% of the participants had paraplegia and 42% had quadriplegia. Additionally, 36% of the population were patients with T7-L1 level of injury (Table I).

3.2. OT interventions

An investigation of the delivered interventions by OT was carried out. Almost all patients Received at least one educational session. Other interventions included: equipment (96%), transfer training (86%), and toileting training (70%). The median of the total time spent on OT rehabilitation during the patients' entire stay was 1785 min (IQR 660–3300 min), equivalent to 43.7 hr (SD 52 hr). The distribution and percentage of therapeutic interventions Received by the study's population are presented in Figure 1. Finally, 98% of the patients from the entire population achieved their treatment goals, while 2% failed due to the severity of SCI symptoms and other health complications related to hospitalization (Table II).

3.3. Variation in treatment time

After categorizing the population based on the level of SCI, the median total of 33 (IQR 20–110) total hours of sessions throughout rehabilitation was Received by patients with C1–C4 injuries, 25 (IQR 15–32) total hours of sessions for patients with C5–C8 injuries, 36 (IQR 5–8) total hours of sessions for patients with T1–T6 injuries, and 29 (IQR 5–53) total hours of sessions for patients with injuries below T6 level (Figure 2).

3.4. The LOS

After calculating the days from the OT referral until the discharge, it was found that the patients with C5–C8 level of SCI had the longest LOS in rehabilitation, while those with T7–L1 had the shortest (Figure 3).

3.5. ASIA impairment score

The ASIA impairment scale describes a patient's functional impairment due to an SCI in activities involving higher-level function and greater complexity. Categories on the scale according to the National Institutes of Health include – Grade A: The impairment is complete, no motor or sensory function; Grade B: the impairment is incomplete sensory function but not motor function; Grade C: The impairment is incomplete motor functional and sensory; Grade D: The impairment is incomplete. Motor function is preserved below the neurologic level, and at least half of the key muscles below the neurologic level have a muscle grade of 3 or more.

The majority of the sample investigated on the ASIA impairment scale scored Grades A and B. In addition, one patient scored Grade D. After comparing the preoperative ASIA impairment score with the ASIA impairment score at the last follow-up, the result showed no difference.

Table 1. Demographic and clinical factors of the study population and the related treatment time.

Variable	Total number (%)	OT Treatment Time (hr) Median (IQR)
Age (median IQR)	28 (22–41)	
Gender		
Male	41 (82)	29 (15–50)
Female	9 (18)	33 (10–80)
BMI		
Underweight	3 (6)	32 (23–210)
Normal	13 (26)	28 (11–49)
Overweight	15 (30)	35 (17–70)
Obese	19 (38)	21 (10–50)
Smoking status		
Non-smoker	34 (68)	29 (10–55)
Smoker	16 (32)	31 (13–55)
Marital status		
Single	28 (56)	29 (13–65)
Married/Divorced	22 (44)	27 (40–10)
Comorbidities		
Diabetes	5 (10)	20 (17–32)
Hypertension	6 (12)	26 (17–50)
Dyslipidemia	3 (6.1)	32 (1–110)
Asthma	1 (2)	–
Mechanism of injury		
Motor vehicle accident	47 (94)	30 (16–56)
Fall	3 (6)	1.5 (1–3.3)
Level of SCI		
C1–C4	11 (22)	33 (20–110)
C5–C7	11 (22)	25 (15–32.5)
T1–T6	10 (20)	36.6 (5–80)
T7–L1	18 (36)	29 (5–53)

IQR: Inter Quartile Range, BMI: Body Mass Index

4. Discussion

This study aims to estimate the time and interventions required for OT for patients with TSCI during inpatient rehabilitation, identify the factors that impact the treatment plan, and compare the patient's independency between admission and discharge by measuring the differences in ADLs performance. However, the findings of this study add a current insight into the use of OT treatment activities and the time spent with patients with different levels of SCI. Also, the study is unique to our population. There is no previously Published: data from Saudi Arabia; however, further studies regarding the role of OT practitioners with SCI would

be worthwhile. Many studies outside Saudi Arabia have described the relationship between OT inpatient rehabilitation interventions and traumatic SCI patient characteristics regarding intervention effectiveness and treatment duration.

4.1. Length of the time

We found that the median OT treatment time was 43.7 hr. The length of OT duration that a patient receives affects the quality of care; therefore, the patient who had fewer days in rehabilitation achieved less than expected goals compared to the one who had more time (15). Additionally, it was found that the occupational therapists spend significantly more

Table II. Occupational therapy interventions based upon the SCI levels

SCI injury levels	Interventions	Session duration (the median of the total number of hours)	Prescribed equipment
C1–C4	Range of Motion exercises, strengthening exercises, stretching exercises, transfer training, bed mobility exercises, positioning, splinting, upper/lower limbs dressing training, toilet training, sensory stimulation, cognitive stimulation, sitting balance training, and hand/fine motor reaching exercises, and weight-bearing exercises	33 (IQR 20–110) over the rehabilitation length of stay	Recliner wheelchair, recliner commode, hospital bed, mattress, and large board transfer
C5–C8	Range of Motion exercises, strengthening exercises, positioning, grooming training, feeding training, toilet training, transfer training, lower/upper limbs dressing training, sitting balance training, bed mobility, hand/fine motor exercises, and weight-bearing exercises	25 (IQR 15–32.5)	Recliner wheelchair, recliner commode, hospital bed, soft gel cushion, and large transfer board
T1–T6	Range of Motion exercises, strengthening exercises, lower limb dressing training, transfer training, toilet training, bed mobility exercises, sitting balance training, splinting, scar management, reaching exercises, sensory stimulation, and hand/fine motor exercises	36.6 (IQR 5–80)	Wheelchair, recliner commode, standard wheelchair, hospital bed, mattress, and small transfer board
T7 and below	Range of Motion exercises, strengthening exercises, toilet training, lower/upper limbs dressing training, transfer training, bed mobility exercises, splinting, positioning, wheelchair training, vocational training, fine motor exercises, and cognitive stimulation	29 (IQR 5–53)	Light wheelchair, powered wheelchair, standard command, small board transfer, air cushion, or a gel cushion

IQR: Inter Quartile Range

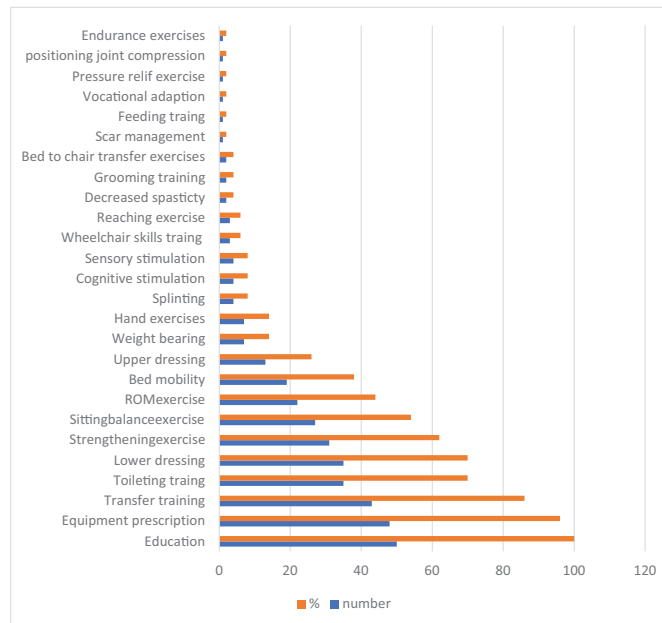


Figure 1. The distribution and percentage of the therapeutic activity that the study population Received.

time working with patients who have a T1–T6 level of traumatic SCI than those with other injury levels.

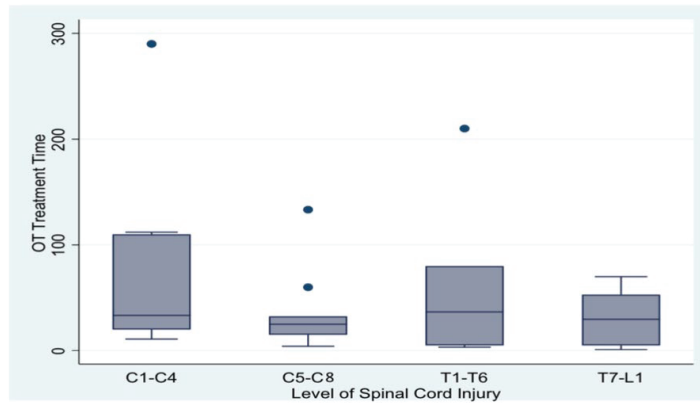


Figure 2. Boxplot for the OT treatment time (hr) during the inpatients stay in relation to the type of spinal cord injury.

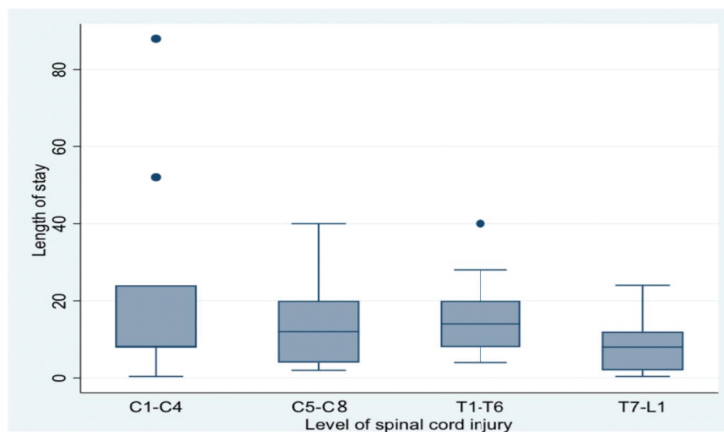


Figure 3. Boxplot for the length of stay in hospital and the type of spinal cord injury.

Because patients with level T1-T6 are more motivated since the injury is less severe than at higher levels (11).

Therapeutic strengthening/stretching and endurance activities are most delivered to patient with TSCI, which is important to serve predecessors for the advancement of functional states. For example, increased sitting tolerance is essential for working in lower dressing, transfer skills. Upper limb strengthening is used to support distal weight can also be used for dressing upper and other ADLs requiring upper limb. However, previous research has reported that early rehabilitation is essential to prevent joint contractures and the loss of muscle strength, conservation of bone density, and ensure

normal functioning of the respiratory and digestive system (11).

4.2. ADLs

OT focuses on ADLs training which is understandable considering the need for personal attention to address the activities and individual patient needs. Patients with higher levels of injury with quadriplegia (42%) have lower strength than other levels, the occupational therapists spent more time working with them on ADLs training. In order to achieve independence with ADL, such (upper and lower dressing, grooming, feeding) repetition is obligatory to optimize independence. The individuals

with paraplegia (58%) do not require as much time to learn ADLs requiring upper limb as higher injury group do; on the other hand, they tend to focus much time on ADLs requiring lower limb, such as lower dressing, bathing, transfers from bed to wheelchair and floor. Due to the benefit of transfer skills for lower levels of injuries, we found that one of the purposes of transfer skills is to permit a patient to function in different environments to increase independence (16). Therefore, patients who have training or education in transfer strategies become more skilled in broader contexts of everyday lives (16). Moreover, as many clients resume daily activities, it was not feasible to teach all the skills or strategies for every situation the patients might encounter when returning to home and community (16). Also, all patients acquired the skills and techniques during therapy to permit them to be independently applied by patients across various situations that may differ from the initial learning event (16).

4.3. Equipment

Patients with higher levels of injuries are completely dependent for ADLs. They require more equipment to prevent further complications and stabilize their condition. To support their back, they need a safety belt that stabilizes their body and equipment such as recliner wheelchair, commode, and mattress to prevent bed sores. On the other hand, patients with lower level of injuries are mostly independent in doing ADLs and require less equipment, usually for transferring – such as light, powered wheelchair.

Our assessment is slightly different from other studies, as this study was conducted at a single rehabilitation hospital with a small sample size. Being the first Saudi Arabian study with in-depth analysis of OT interventions for each type of SCI patient is the strength of the current study. However, it has a limitation associated with sample size, which affects

the reliability of the study's findings because it leads to higher variability, leading to bias. Thus, future investigations with higher sample sizes and multiple rehabilitation centers are recommended.

5. Conclusion

Significant variations were seen in time spent on patients with TSCI for all OT interventions when examining the median of the total number of hours. Some of the variations can be explained by the patient and injury characteristics. Further research could also be conducted to determine the effectiveness of OT interventions with TSCI patients in ICU.

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Conflict of Interest

The authors declare no conflict of interest.

Authors' Contribution

FK, TA, KA, YT, AA, and FO drafted the initial manuscript, worked on the data acquisition, and edited the manuscript. FK developed the project, supervised the work, and revised and reviewed the manuscript. All authors read and approved the submitted version of the manuscript to be published.

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