

Essential Spinal Cord Injury Rehabilitation in Acute Care

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Abstract

Comprehensive rehabilitation is essential to maximize the functional potential of individuals who have been diagnosed with spinal cord injury (SCI). At Harborview Medical Center (HMC), our SCI program's mission is to provide excellent, comprehensive rehabilitation therapy across the continuum of care. In response to national trends of decreasing inpatient rehabilitation stays, HMC developed a cross-continuum, multidisciplinary SCI Committee in 2016 to examine our SCI program. The SCI Committee found inefficiencies with transitions and inconsistencies within therapy workgroups when treating patients with SCI. The SCI Committee worked for over 18 months to update HMC's SCI guidelines and collaborated to improve efficiencies for patient and staff education. Through the work of the committee, we implemented therapy practices to initiate specialized SCI rehabilitation more acutely in a patient's hospital course. Providing rehabilitation therapies in the acute care unit and intensive care unit (ICU) settings comes with challenges. Understanding these challenges can help identify areas we can make a positive impact and highlight areas that remain as barriers to providing rehabilitation therapy. As a result of our program overhaul, we have seen more efficient transitions between workgroups, decreased lengths of stay on inpatient rehabilitation, and increased staff knowledge about providing therapy for people with spinal cord injuries.

Introduction

There are an estimated 17,700 spinal cord injury (SCI) survivors each year in the U.S., which means that 54 people out of every million Americans suffer an SCI each year. Hospital lengths of stay for patients with SCI have decreased to an average of 11 days in acute care units and 25 days on inpatient rehabilitation units as compared to the 1970s when patient stays averaged 24 days on acute care and 98 days on inpatient rehabilitation (National Spinal Cord Injury Statistical Center, 2018). In our changing healthcare landscape with decreased lengths of hospital stays, comprehensive SCI rehabilitation has become a more limited resource and is increasingly difficult for patients to access (Cheng et. al, 2017).

Harborview Medical Center is a county owned hospital in Seattle, WA and serves as the region's only designated Level 1 adult and pediatric trauma center, and the region's only verified burn center. It is the regional trauma and burn referral center for Washington, Alaska, Montana, and Idaho. This medical institution has 413 licensed acute care beds, 24 inpatient rehabilitation beds, and a comprehensive outpatient rehabilitation program. In 2018, there were 240 patients diagnosed with spinal cord injury at this institution and the average length of stay for patients with SCI was 26 days on acute care and 30 days on the inpatient rehabilitation unit. It is important to note that lengths of stay in this setting are impacted by a number of factors such as the medical and social complexity of the patient population. Individuals given priority for care at this institution include non-English speakers, low income individuals, the uninsured or underinsured, individuals who are incarcerated, and individuals with mental health or

substance abuse problems. These factors that impact hospital length of stay may also impact discharge planning.

According to institutional metrics, of the 240 patients admitted with the diagnosis of SCI in 2018, approximately half discharged directly from ICU or acute care to inpatient rehabilitation while most of the other half discharged either directly to home or to a skilled nursing facility (SNF) (Figure 1). There are various reasons why a patient may not discharge directly to an inpatient rehabilitation program. For example, a patient may have orthopedic injuries with associated weight-bearing precautions that would preclude adequate participation in the progression of rehabilitation activities; thus, that patient may discharge to a subacute location such as a SNF until the weight-bearing precautions have been discontinued.

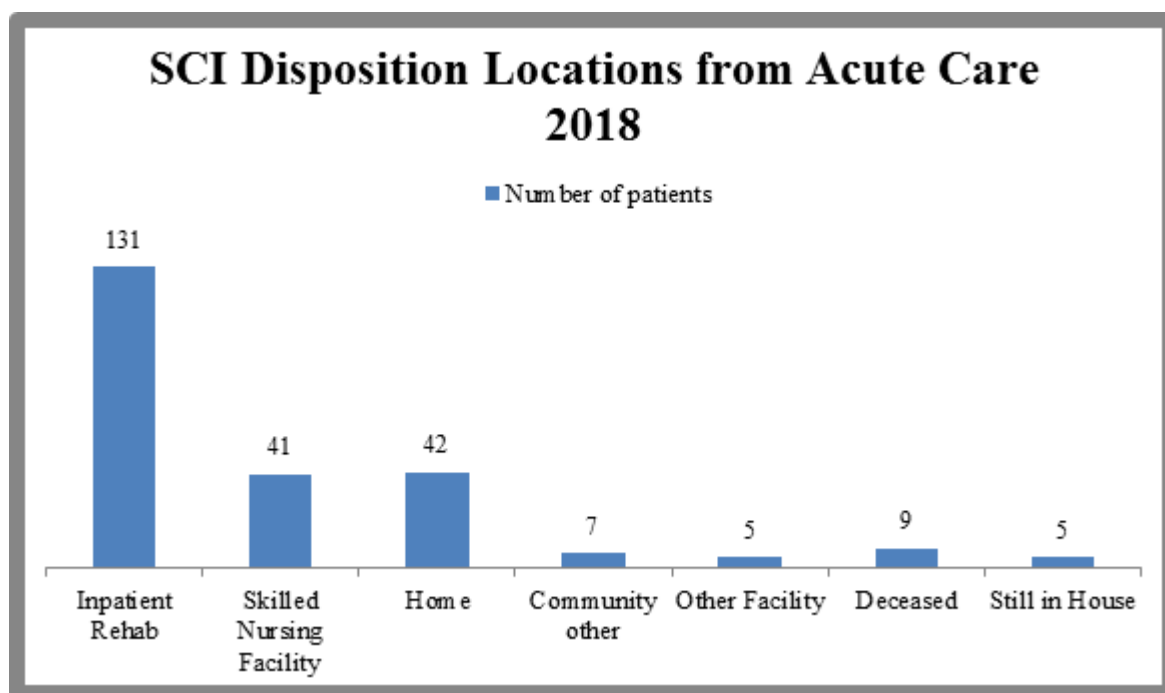


Figure 1. SCI Dispositions from HMC Acute Care in 2018

The mission of the spinal cord injury program at this institution is to provide outstanding comprehensive rehabilitation therapy to people with SCI across the continuum of care. Given the limited amount of time patients have on inpatient rehabilitation units and the possibility of patients discharging from acute care directly to a SNF or home, it is vital to initiate specialized rehabilitation therapies and education for those with SCI earlier in their hospital course (Rozeboom, Parenteau, & Carratturo, 2012). In light of this reality, it was important to analyze the SCI program across the continuum, with particular attention to the intensive care and acute care settings to ensure the realization of the SCI program's mission.

Several databases were searched including PubMed, Cochrane Library, and CINAHL to find resources that would help inform this analysis, but unfortunately there were few guidelines geared to rehabilitation therapists treating patients with SCI in the ICU and acute care settings. The authors hope that by sharing the experience at this institution, it will encourage the acute rehabilitation therapy community to review their own practices for delivering specialized spinal cord injury interventions acutely in a patient's hospital course. It is important to note that the findings described in this article reflect the experience of one medical institution (Harborview Medical Center) and that every medical facility and location will present its own set of challenges and barriers. Programs must be individually crafted to fit the needs unique to each care setting.

Objectives

The primary objective of the SCI program analysis was to establish and address the essential components of rehabilitation for patients with SCI across the continuum of care. Secondary objectives included evaluation of challenges encountered when providing rehabilitation services in the ICU and acute care settings and assessment of outcomes following changes made to the spinal cord injury program at this institution starting in 2016.

Methods

In 2016, an SCI Committee was established consisting of a multidisciplinary team of therapists who specialize in spinal cord injury rehabilitation therapy from across the continuum of care including ICU, acute care, inpatient, and outpatient rehabilitation settings. The SCI Committee was tasked with reviewing and updating the SCI rehabilitation program at this medical institution. Over the course of 18 months, the SCI Committee established core foundational skills, created a series of educational sessions for therapists from across the continuum of care, and updated educational materials for improved consistency between workgroups.

The SCI Committee established core foundational skills to help guide rehabilitation interventions for a person with a spinal cord injury (Figure 2). Foundational skills were informed by the collective experience of the SCI Committee as well as the clinical practice and treatment guidelines published by the Paralyzed Veterans of America which were based on evidence-based research by the Consortium of Spinal Cord Medicine (2008). Additional feedback and support was provided to the SCI

Committee by the University of Washington SCI leadership group and hospital rehabilitation management. These foundational skills were then used to create SCI guidelines, shape staff educational series, and guide mentored sessions with therapists.

Foundational Skills for Rehabilitation Therapy Management of SCI	
Paraplegia - Upper extremity strength - Range of motion - Balance/Posture - Respiratory - Endurance - Upper extremity preservation - Skin protection - Cognition - Tone - Mobility equipment - SCI Education	Tetraplegia - Upper extremity strength - Range of motion - Balance/Posture - Respiratory - Endurance - Wrist and hand preservation - Shoulder and elbow preservation - Swallowing - Tone - Cognition - Skin protection - Mobility equipment - SCI Education

Figure 2. Abbreviated List of Foundational Skills for Therapists

To educate therapy staff, the SCI Committee created an education series titled “SCI Boot Camp.” Content for boot camp sessions was designed to provide opportunities for therapy staff to practice basic skills needed to safely and effectively treat patients with spinal cord injury and to ensure that therapy staff across the

continuum have consistent information to guide therapy interventions. Boot camp participants include occupational therapists, physical therapists, speech language pathologists, recreational therapists, and child life staff from across the continuum of care. SCI boot camp is comprised of a self-study of SCI medical knowledge and a series of five hour-and-a-half long educational sessions including: foundational skills, upper extremity preservation, mobility training, basic seating, and considerations for tetraplegia. Boot camp sessions are structured to prioritize hands-on skills practice rather than formatted as lectures. Boot camp sessions are led by SCI Committee members and were initially held every few months until most of the institution's therapy staff had the opportunity to participate. Moving forward, SCI boot camp will be offered based on staff educational needs.

Prior to attending the first SCI boot camp session, participants are required to complete a self-study medical module. The SCI medical module reviews fundamental medical knowledge of SCI including neurological and functional classifications of SCI, terminology related to SCI such as complete and incomplete injury, SCI syndromes such as Central Cord Syndrome and Brown Sequard Syndrome, and common secondary complications related to SCI such as autonomic dysreflexia and orthostatic hypotension.

The first boot camp session examines the SCI foundational skills that were established by the SCI Committee. Participants are introduced to concepts the rest of the boot camp sessions build upon starting with range of motion considerations for SCI, practicing postural and trunk exercises, pressure relief strategies, preparatory bed mobility skills, and balance training while sitting at the edge of bed or mat.

The upper extremity preservation session focuses on practicing safe strategies for upper extremity range of motion, edema management, and positioning (bed, wheelchair, and orthotic options). Participants review concepts for skin preservation, spasticity, and pain management. Participants explore SCI educational resources to share with patients and families.

The mobility session delves into the key components for teaching mobility skills such as motor learning, use of gravity and momentum, and how timing is important to maximize efficiency with movement. Participants practice strategies for bed mobility, sitting, scooting, and transfers and review an assessment tool to objectively measure transfer quality. Basic seating education introduces seating options available at this institution including wheelchairs and bedside chairs. Participants review wheelchair components and practice properly measuring for a wheelchair. Participants are oriented to power wheelchairs and practice adjusting components such as headrest, specialized cushions, and wheelchair backs.

The final SCI boot camp session is focused on considerations for tetraplegia. Participants review swallow anatomy and changes after a cervical SCI, cuffed versus cuffless tracheostomy, and alternative communication strategies. Participants are educated on assistive technology (AT) resources available at the institution, explore call light options, and strategies for accessing basic technology such as a smartphone or computer.

In addition to attending boot camp, therapists complete mentored sessions to improve their hands-on skills. Mentored sessions focus on taking the basic skills learned during boot camp and applying them during evaluation and intervention

sessions with the guidance of a mentor. The number of mentored sessions and timing of the sessions varies based on individual staff comfort level and ability to provide high quality SCI rehabilitation. SCI skill building mentored sessions initiated in the ICU and acute care floors includes:

- Self-care training
- Mobility training
- Equipment including power mobility, manual mobility, and orthosis fabrication
- Caregiver training
- Patient and family education
- Exposure to assistive technology
- Preparation for next level of care

Staff feedback gathered from SCI boot camp session evaluations and discussions within the SCI Committee helped to identify challenges faced when providing rehabilitation therapy in the intensive care units and acute care settings. These challenges included:

- SCI diagnosis may not yet be established as work-up of injury level may still be evolving.
- Not all ICU and acute care providers have specialized SCI training, and therefore follow-through with SCI recommendations may be inconsistent.
- Treatment space can be limited to hospital bed or the confines of hospital room/unit.

- SCI educational materials not standardized across work groups.
- SCI educational materials not readily available in the various acute care and ICU patient areas.
- Access to appropriate seating and assistive technology devices may be limited.
- Communication between acute care, inpatient rehabilitation, and outpatient therapy workgroups may be limited.
- Medical acuity and barriers that can limit participation including complexities associated with polytrauma, orthopedic injury, pain, and medical precautions.
- Limited research focused on SCI rehabilitation therapy in the ICU and acute care settings.
- Hospital readmission for individuals with SCI who develop chronic complications such as syrx, pressure ulcers, respiratory distress, or failure to manage at home (Sezer, Akkuş, & Uğurlu, 2015). Currently there is a 30 percent annual re-hospitalization rate after SCI (National Spinal Cord Injury Statistical Center, 2019)
- Social, environmental, and financial barriers may complicate discharge planning, impacting consideration for admission to rehabilitation unit and ongoing access to rehabilitation therapies outside of the hospital.

Acknowledging the many challenges faced in the acute and ICU settings helped demonstrate the context therapists work within and identify focus areas to influence in order to minimize barriers to appropriate care. Strategies to address some of these challenges are described below.

Acute care therapists often complete evaluations with patients before an SCI diagnosis is confirmed or the diagnosis has not yet been explained to the patient or family by the medical team. When acute care therapists are knowledgeable about SCI rehabilitation, focused education can be initiated on relevant topics such as skin and upper extremity preservation, positioning, access to technology, and early mobilization options even though medical work up may be ongoing. By educating therapy staff about best practices for topics such as positioning and skin preservation, therapists are more effectively able to advocate for patient care. This leads to improved understanding and follow through with therapy recommendations by staff including physicians, nurses, and hospital assistants. Additionally, initiating the use of specialized equipment such as power wheelchairs to trial in the ICU or acute care settings can improve a patient's independent ability to initiate position changes, including tilt backs for pressure relief, which further decreases dependence on staff assistance.

Prior to the establishment of the cross-continuum SCI committee, therapy efforts often occurred in departmental silos and transitions between workgroups were not always as efficient as possible. As patients advanced through their rehabilitation course, therapists from different workgroups provided a variety of handouts and materials that were not consistent. This led to patient and caregiver confusion. To address this, the SCI Committee standardized the educational materials provided to patients with SCI

and their families while being treated at this institution. Educational materials are now catalogued on the institution's internal intranet, allowing materials to be easily accessed and printed for distribution from any location in the hospital. Improved consistency of educational materials enables more effective progression of education across the continuum of care. Educational materials typically provided by the ICU/acute care therapists include a basic overview of the institution's SCI program, basic information about skin care, bowel and bladder care, positioning, and introduction to range of motion exercises. Other educational materials include more detailed information about self care topics, shoulder preservation, travel, emergency preparedness, home modifications, and SCI resources (Figure 3). The SCI Committee also developed a therapy assessment tool which can be used to guide patient-centered goals for meaningful treatment planning and compiled a list of resources offered at this institution relevant to patients with SCI.

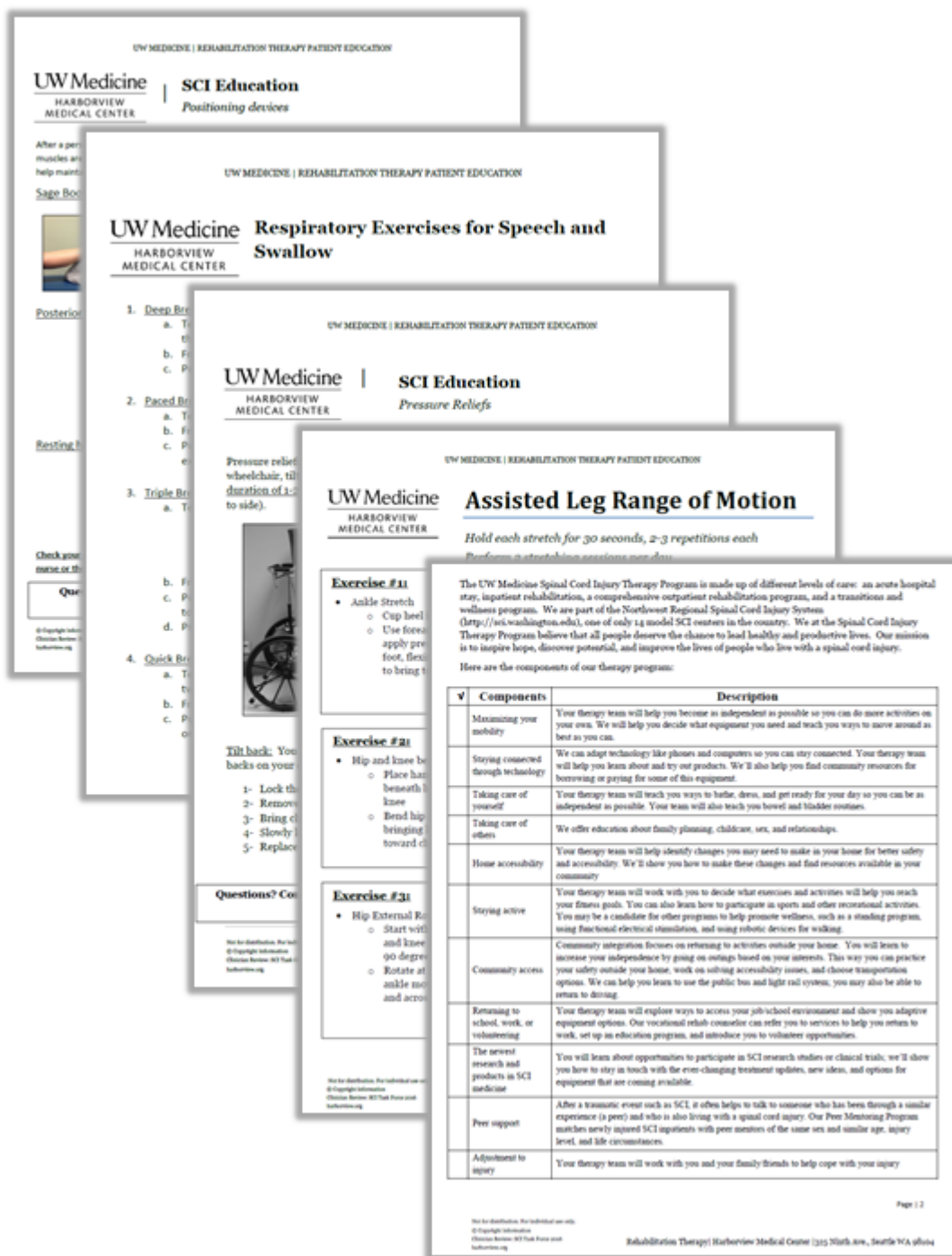


Figure 3. Samples of handouts for SCI education

The provision of education is adjusted to meet the patient and family where they are in the process of understanding and accepting their SCI. Occupational therapists are skilled at grading content to meet individual needs. Educational materials are provided in a variety of mediums including written, visual, verbal, and tactile content to best address personal learning styles.

Despite limited access to assistive technology (AT), a patient's personal technology or community resources such as technology lending libraries like the Washington Assistive Technology Act Program (WATAP) can be used to trial specialized equipment while patients are on acute and ICU settings. At this institution, therapists from across the continuum are collaborating to develop mobile AT carts and an AT center. The mobile AT carts will meet the hospital's infection control standards and can be used at a patient's bedside to trial technology options when a patient is unable to mobilize out of their room. Some of these technology options may include sip and puff or switch access for a tablet or smartphone which can be mounted on adjustable arms, bedside tables, or the frame of the hospital bed or wheelchair to accommodate patient positioning needs in the hospital bed or wheelchair. The AT center will be a shared space used across the continuum to trial technology (environmental controls, adaptive gaming controls, adaptive computer access, and switch, voice, or sip and puff control for tablet and smartphone use) in a functional living environment.

Each SCI boot camp educational session included therapy staff from across the continuum of care which provided opportunities to network, build connections and share knowledge. This has led to breaking down departmental silos, improved communication

between work groups, and increased opportunities for collaboration such as the cross continuum project to develop the shared AT center and mobile AT carts.

Orthopedic precautions, pain, and limited treatment space options continue to impede early access to the progression of skilled SCI rehabilitation therapies. Although not all of the challenges identified in the acute and ICU settings can be overcome, by recognizing the challenges, there is a better understanding of the practice components therapists can impact and where to focus continued efforts for improvement.

Results

One year after the implementation of this institution's updated SCI program, the primary objectives of the SCI program analysis have been achieved. The essential components of rehabilitation for patients with SCI across the continuum of care have been established and addressed with the development of the SCI committee, SCI boot camp, and SCI mentored sessions. Boot camp was attended by over 90 Harborview therapists from across the continuum of care. Participant feedback was gathered from each participant after every boot camp session. Of the 311 feedback forms, 94% of the responses were rated 4 or 5 on a five-point Likert scale, 0 being not useful or disagree and 5 being very helpful or highly agree. Trends noted in the comments of the feedback forms included appreciation of the hands-on practice and the opportunity to work with therapists from other work groups. Therapy staff performance during SCI mentored sessions reflect an improvement in skills for providing safe and effective SCI evaluation and intervention earlier in a patient's hospital course while still in the ICU or acute care setting.

There has been a reduction in challenges and barriers that previously inhibited rehabilitation therapy interventions in the ICU and acute care settings. For example, there are now options for accessing AT in the intensive care unit and acute care settings such as mobile AT carts, AT lending libraries, and the shared AT space at this institution will soon be available. Another challenge that has been addressed is improving access to SCI educational materials by using the institution's intranet to host content which can now be accessed from any computer on the hospital campus. It should be noted that although trends in length of stay for patients with SCI at this institution fluctuate, a progressive reduction in the overall length of stay for patients with tetraplegia has been observed after the creation of the SCI Committee in 2016.

Conclusions

Through the establishment of a cross-continuum SCI committee, the rehabilitation program within an acute care setting was effectively updated. Therapists practicing in ICU and acute care units of this institution initiate essential components of SCI rehabilitation earlier in a patient's hospital stay and have consistency in educational materials for patients, families, and staff across the continuum of care. Educating acute rehabilitation therapy staff with skilled SCI rehabilitation allows for more effective patient advocacy. Using the "boot camp" model provides clinicians representative of each workgroup opportunities to build connections with each other, which ultimately improves transition efficiency along the continuum. We also hope increasing access to specialized SCI rehabilitation earlier in the rehabilitation process will help patients and families better advocate for their care needs, particularly if they do not discharge directly from intensive or acute care setting to a specialized SCI rehabilitation setting.

In addition to addressing the needs of the institution's newly diagnosed SCI population, the SCI Committee addressed the needs of patients with chronic SCI when readmitted to the hospital for a new injury such as an acute fracture or wound. Using the tools from SCI boot camp, the rehabilitation team in the ICU and acute setting is competent with making appropriate recommendations for seating, equipment, and activities of daily living management in order to facilitate a safe discharge to their prior living environment directly from these treatment areas.

Identifying challenges faced in the ICU and acute care settings helped recognize issues therapists can have an impact on and what therapists may not be able to change. Having the support of management and administration for this level of program development has been crucial to the success of the SCI Committee's goals, given the effort and time that SCI Committee members needed to dedicate to this effort and the commitment to engage all staff from across the continuum in this educational process.

Although length of stay for patients with SCI at this institution has fluctuated over the past few years, a steady decrease in the overall hospital length of stay including ICU, acute care, and inpatient rehabilitation for patients with tetraplegia has been observed since the creation of the SCI Committee in 2016. It is possible that improved efficiencies across the continuum of care and implementation of relevant SCI interventions earlier in a patient's hospital course have been impactful on overall length of stay. For example, ordering specialized equipment like rolling shower commode chairs or power wheelchairs to trial while still in the ICU or on acute care may allow for earlier successes with establishing bowel program routines and practicing with power wheelchair controls versus waiting to train with this equipment in inpatient rehabilitation.

However, decreased length of stay could simply be a reflection of a general trend toward progressively shorter hospital stays or a continuation of fluctuating lengths of stay that have historically been observed at this institution. Further research is recommended to investigate these findings.

It is not our intention to further minimize access to SCI rehabilitation therapies. Our goal is to increase the efficiency of the progressively limited therapy time that we do have with our patients with SCI. Therefore, we would like to assert that length of stay is not the primary metric we would like to use in order to measure the success of the improvements to HMC's SCI program. We prefer to measure the success of this program by the response of therapy staff to new educational opportunities, demonstrated skills improvement as evidenced in mentored SCI session performance, decreased challenges in the ICU and acute care settings, and increased collaboration across the continuum. Based on the results we saw after updating our SCI program, the researchers and committee members believe that initiating SCI rehabilitation therapy in the ICU and acute care settings is essential to maximizing a patient's access to specialized SCI rehabilitation and that collaboration with providers across the continuum of care is vital to the success of a comprehensive SCI rehabilitation program.

Recommendations for Future Projects and Potential Research

There are many opportunities to further develop the role of rehabilitation therapies in the ICU and acute care settings. Some recommendations for research and future projects identified during this program analysis include:

- Establishment of more detailed clinical guidelines to help inform SCI rehabilitation specifically in acute care and ICU settings.

- Further assessment of strategies for addressing the challenges that inhibit access to rehabilitation therapies in the ICU and acute care settings.
- The development of metrics to measure the impact of providing SCI rehabilitation earlier in a patient's rehabilitation course in ICU and acute care settings. Data measurement opportunities may include:
 - Reduction in secondary complications common to patients with SCI, such as shoulder pain or pressure wounds
 - Impact on inpatient rehabilitation length of stay
 - Reduction in hospital readmission for patients with SCI
 - Measurement of patient satisfaction in the context of improved efficiencies and consistency across the continuum

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