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## **Rebuilding Strength and Independence: A Comprehensive Rehabilitation Journey for Pravin after Spinal Cord Injury**

*Sneha Hiren Bhalala (PT)*

Assistant Professor  
SPB Physiotherapy College, Surat.

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### **Introduction:**

The devastating consequences of spinal cord injury (SCI) are often profound, affecting not only physical function but also the emotional and social well-being of individuals. Pravin, an 11-year-old boy, found himself thrust into the challenging world of SCI following a traumatic motor vehicle accident. Despite the severity of his injuries, Pravin's journey toward recovery embodies the remarkable resilience and determination inherent in the human spirit.

The circumstances surrounding Pravin's accident were harrowing; ejected from a car during a collision, he suffered a T-6 spinal fracture with spinal cord infarct, along with a myriad of other injuries including epidural hematoma, occipital fracture, pulmonary contusions, and iliac fracture. The abrupt upheaval of his life left Pravin facing not only physical trauma but also emotional turmoil, exacerbated by familial challenges stemming from his parent's divorce.

Upon admission to an inpatient rehabilitation program, Pravin's prognosis appeared daunting. With no movement below the T-6 level and significant challenges in mobility and flexibility, the road to recovery seemed arduous. However, guided by a multidisciplinary team of healthcare professionals, including physical therapists, Pravin embarked on a comprehensive rehabilitation journey aimed at restoring his strength and independence.

Central to Pravin's rehabilitation was the establishment of ambitious yet attainable goals, addressing a spectrum of physical and functional impairments. From enhancing his endurance and flexibility to mastering essential skills such as transfers and wheelchair mobility, Pravin's rehabilitation program encompassed a holistic approach tailored to his unique needs and aspirations.

The collaborative efforts of Pravin's care team extended beyond physical rehabilitation, encompassing psychosocial support, education, and discharge planning. With meticulous attention to detail, his caregivers meticulously planned for his successful reintegration into his home, school, and community, recognizing the importance of holistic care in facilitating Pravin's transition back to a fulfilling life.

Moreover, Pravin's journey underscores the vital role of adaptive sports and leisure activities in promoting physical and emotional well-being post-SCI. The introduction of activities like sledge hockey not only rekindled Pravin's passion for athletics but also provided a sense of purpose and belonging, highlighting the transformative power of recreational pursuits in the rehabilitation process.

As Pravin prepares to transition to outpatient care, his story serves as a poignant reminder of the resilience of the human spirit in the face of adversity. Through unwavering determination, comprehensive rehabilitation, and a supportive care network, Pravin exemplifies the transformative potential of rehabilitation in rebuilding lives shattered by spinal cord injury.

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### **Case Description:**

Pravin is an 11-year-old boy who was involved in a motor vehicle accident. He was an unrestrained rear-seat passenger and was ejected from the car when it struck a tree. He had lost consciousness and was intubated at the scene. In the emergency room, he was noted to have no movement in both lower extremities and computed tomography revealed a T-6 fracture with spinal cord infarct. Other injuries included left epidural hematoma, occipital fracture, bilateral pulmonary contusions, and right iliac fracture with retroperitoneal hematoma. During this time, he received acute-care physical therapy to address ROM, positioning, elevating the head of the bed to increase upright tolerance, and caregiver education. Once Pravin was extubated and stabilized, he was admitted to an inpatient rehabilitation program. Socially, he lived with his mother and two younger siblings in a two-story house with his bedroom and bathroom on the second floor and two steps to enter. His father was the driver of the vehicle, and his parents were in the process of a divorce. He attended the local public school and was extremely involved in athletics.

**Examination**

Pravin presented with 4/5 strength above the level of T-6 and 0/5 strength and no sensation below that level. He was wearing a thoracic–lumbar–sacral orthosis (TLSO) for fracture stabilization and was not yet cleared for lower extremity weight bearing. His tone was grossly 2 on the modified Ashworth scale throughout his lower extremities, with three beats of clonus in each ankle and occasional flexor spasms in his left lower extremity when touched. His passive ROM was within normal limits throughout, with a bilateral straight leg raise to 90 degrees. He was able to roll with minimal to moderate assistance using bed rails and transferred the wheelchair to a level surface with a transfer board, push-up blocks, and moderate assistance. He required minimal assistance to sit upright and moderate assistance to reach outside his base of support.

**Evaluation**

Pravin presented with decreased strength, decreased endurance, decreased flexibility, decreased bed mobility, decreased transfers, decreased functional mobility, and a need for family education. Goals established at that time to be achieved during the inpatient rehabilitation admission included:

1. Roll independently supine to prone without a bed rail
2. Side-lying to sit with minimal assistance for lower extremities only
3. Transfer to level surfaces with a transfer board and contact guard assistance
4. Transfer to uneven surfaces with a transfer board and minimal assistance of one
5. Transfer floor-to-wheelchair with assistance only for lower extremities
6. Stand in parallel bars with bracing as needed and contact guard for 5 minutes with vital signs stable
7. Ambulate 25 feet with a walker and bracing as needed and contact guard assistance
8. Independent wheelchair mobility on level surfaces for 3000 feet without fatigue
9. Ascend and descend a 2-inch curb in his wheelchair with a spotter
10. Independence with wheelchair push-ups for pressure relief every 30 minutes
11. Patient independent with self-ROM
12. Caregiver independent with passive ROM, knowledge of skin checks, safeguarding for all levels of functional mobility, and all adaptive equipment management

**Physical Therapy Diagnosis**

Decreased strength and functional mobility due to ASIA A T-5 SCI.

**Physical Therapy Prognosis**

Excellent potential to achieve the above goals due to current physical status, motivation, and family support. Based on the evidence, Pravin has the potential to ambulate household distances with bracing and an assistive device but will most likely be a primary wheelchair user in the community.

**Interventions****INCREASING UPRIGHT TOLERANCE**

Utilized compression stockings, and abdominal binder to help prevent orthostatic hypotension. Increased time out of bed in a wheelchair and on a tilt table using knee immobilizers and solid AFOs for stability in the weight-bearing position.

**INCREASING STRENGTH**

Worked with an interdisciplinary team on increasing arm strength throughout the day. Activities included progressive resistive exercises, trunk strengthening, and upper extremity dynamic activities.

**INCREASING FLEXIBILITY**

Performed ROM and stretching exercises to the lower extremities, which were carried out by family members as a bedside exercise program under the supervision of nursing staff. Pravin was eventually taught to perform self-ROM. Special care was taken to allow enough hamstring flexibility to allow future floor-to-chair transfers and to maintain length in hip flexors and heel cords to allow for standing and assistive ambulation.

**INCREASING BALANCE**

Pravin initially worked on improving sitting balance and reaching outside his base of support with his TLSO, but later learned to sit without the TLSO when it was discontinued owing to fracture stability and healing.

## **INCREASING ENDURANCE**

Worked on increasing periods of aerobic activity, including dynamic activities, wheelchair propulsion, and recreational activities, which will be described later.

## **MAINTAINING SKIN INTEGRITY**

Pravin was instructed to perform wheelchair push-ups to provide adequate pressure relief. He was also instructed to perform daily skin checks on all insensate areas. He maintained a positioning program in bed and used a gel cushion in his wheelchair.

## **IMPROVING BED MOBILITY AND TRANSFERS**

Pravin was instructed in the head-to-hip relationship and was taught how to move his body without creating shear forces along his bottom. He initially used a transfer board to perform transfers but eventually was able to transfer with no equipment and use a transfer board only for car transfers. He was also trained in techniques for floor-to-chair transfers, scooting along the floor, and bumping up and down steps.

## **AMBULATION**

Pravin initially began standing in the parallel bars using knee immobilizers, temporary solid ankle orthoses, and his TLSO. He attempted to learn how to hang on his Y ligaments, but this was very difficult with the TLSO. Once the TLSO was no longer necessary for fracture stabilization, Pravin was able to align and position himself in a standing position in the parallel bars. He was extremely motivated to walk using any assistive device or bracing necessary despite the knowledge of its difficulties. He started with a pair of RGOs, and after much practice preferred to swing through rather than utilize the reciprocating mechanism, which he thought was slower and made him feel more fatigued. He was ordered and received a pair of lightweight single upright THKAFOs (trunk-hip-knee-ankle-foot orthoses) and was trained in donning, doffing, and ambulation.

## **IMPROVING WHEELCHAIR SKILLS**

Pravin was trained in propulsion, wheelies, ascending and descending curbs and ramps, and wheelchair recoveries. He was also trained in basic wheelchair maintenance.

## **EQUIPMENT**

Pravin received multipodus boots to wear in bed, moulded AFOs to wear while in his wheelchair, THKAFOs for standing and walking, forearm crutches, a rigid-frame wheelchair, a transfer board, a commode, and bath equipment.

## **FAMILY EDUCATION**

Pravin's mother was trained and independent with safeguarding for all levels of functional mobility, adaptive equipment management, and coaching Pravin with his home exercise program. Pravin was independent in pressure reliefs, skin checks, his home exercise program, and training others how to safely assist him when needed. With the aid of the interdisciplinary team, Pravin and his family were provided with basic knowledge of SCI in general and living with a disability.

## **Reexamination**

Pravin was reexamined during several points of his admission, but most notably when he had a change in medical status. Once his spinal fractures were adequately healed and he no longer required the use of the TLSO for fracture stabilization, Pravin's entire centre of gravity changed, and he needed to learn to use his body differently. He was also fully reexamined at the time of discharge from the inpatient setting, and he still had several physical therapy needs that were to be taken care of on an outpatient basis.

## **The Interdisciplinary Team**

As is the case with most inpatient rehabilitation settings, Pravin had a full team of professionals working closely on his case to achieve his family's goal of safe discharge back home. Although various disciplines have specific roles in caring for a child with an SCI, the team must communicate and work closely together. There is often overlap between professionals, and all team members should carry over the teaching of others to provide optimal family-centred care. Pravin had a rehabilitation doctor overseeing his medical course with consulting medical services as needed such as orthopaedics and urology. He also had nurses who primarily focused on skin, education, bowel and bladder programs and carrying over day-to-day skills such as ADLs and transfers. Psychosocial support came from a psychologist, child life staff, a social worker, and the hospital chaplain. Educational needs were covered by the education coordinator, teacher, and neuropsychologist. He received speech therapy initially to work on increasing speaking volume and intensive occupational therapy to achieve goals of independence in ADLs. Physical therapy, occupational therapy, and nursing worked closely together so that Pravin had the opportunity to practice new skills in a variety of environments. Together, the team, Pravin, and his mother were able to achieve his family goal of successful reintegration back into home, school, and the community.

## **Discharge Planning**

To ensure successful reintegration back to home, school, and the community, discharge planning began from the first day of admission. His family learning styles and needs were assessed and barriers to successful reintegration into the world were identified. First, owing to Pravin's mild traumatic brain injury, he was fully assessed by the hospital education staff and neuropsychologist to identify any new cognitive or learning needs upon return to

school. Several meetings were set up with the staff at his school to problem-solve determine an appropriate educational plan and remove any physical barriers. To prepare Pravin to go home, the physical and occupational therapists performed a home evaluation with both Pravin and his mother present. Measurements were taken and the basic layout was assessed to make appropriate home modification recommendations, but Pravin and his mom also had the opportunity to practice transfers and mobility under the direction of the therapists. The therapists were then able to identify any new physical or occupational needs and what still required more practice in the hospital environment before discharge home. Child life and psychology were instrumental in working with Pravin's psychosocial issues regarding transition back into the community, but physical therapy played a large role in helping Pravin identify what types of leisure activities he may enjoy. Previously an athlete, Pravin was very interested in pursuing adaptive sports, including wheelchair basketball. Physical therapy introduced him to the idea of sledge hockey, and Pravin soon found it to be his favourite activity. The therapist had a loaner roller sledge for Pravin to try out while still an inpatient and helped him and his mom connect with community resources so that he could join a team upon discharge. Pravin was thrilled at the idea of playing sports again, making contacts with peers and adult athletes with SCIs, and stated that his new goal was to play sledge hockey for the Indian Paralympic team. This illustrates the importance of considering the entire disablement spectrum to treat patients holistically. Follow-up services were established, and Pravin had a series of scheduled appointments with physicians trained to follow the needs of a person with SCI through the life span. Pravin and his mom were given the tools needed to be advocates for themselves in both the health care and school systems as well as community resources to provide help along the way.

### The Continuum of Care

Pravin was recommended to be followed by outpatient physical therapy closer to his home to continue to work on progressing wheelchair and ambulation skills to achieve his ultimate long-term goal of becoming as independent as possible. A recent study noted that patients with SCI who achieve a higher level of independence have improved quality of life and smoother transition to adulthood.<sup>72</sup> Pravin may present with new pathologies, impairments, functional limitations, or disabilities as he grows and develops throughout his lifetime and may require future episodes of care from a PT. Emphasis should be placed on resolving those new problems and returning the patient to self-sufficiency, wellness, and a healthy lifestyle.

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