Occupational Therapy Management of the Acute Spinal Cord–Injured Patient

(acute care; orthotic devices; services, occupational therapy; spinal cord injuries)

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This report describes an occupational therapy program for the patient with an acute spinal cord injury. The program includes guidelines for evaluation and treatment, criteria for early orthotic selection, and psychological considerations. The program was developed by the occupational therapy staff at Northwestern Memorial Hospital, Chicago, in conjunction with a medical team and occupational therapy staff from the Rehabilitation Institute of Chicago. The intent of the program is to implement rehabilitation in the acute care environment immediately.

The rehabilitation of the spinal cord–injured patient should be initiated within the first 48 hours of admission to the acute care setting. Patients who receive early intervention may be better prepared physically and psychologically to accept their disability, and they may participate actively in setting realistic rehabilitation goals. Moreover, clinical research verifies that early intervention will significantly reduce the potential for contractures, medical complications, extended length of hospitalization, and overall cost of health care (1, 2).

This article describes the occupational therapist’s role in the early evaluation and treatment of individuals with spinal cord injury (SCI) admitted to Northwestern Memorial Hospital, a tertiary care facility.

An Overview of the Acute Medical Management of the SCI Patient

A primary aspect of the acute care of the SCI patient is the coordination and expertise of all members of the health care team. The team at Northwestern Memorial Hospital comprises the following persons: orthopedic surgeon, neurosurgeon, respiratory physician, nurse, respiratory therapist, social worker, chaplain, nurse clinician, physical therapist, and occupational therapist. In addition, a liaison/physiatrist from the Rehabilitation Institute of Chicago (RIC) evaluates and maintains contact with those patients who will be transferring to RIC.

Upon entry to the emergency room, the SCI patient usually experiences the following intervention: (a) evaluation by orthopedic, neurosurgery, and respiratory physicians who determine the diagnosis and extent of SCI; (b) immediate application of traction and immobilization on either a Stryker frame or Rotorest bed (see Figures 1 and 2); and (c) transfer to the spinal cord intensive care unit for a minimum of 24 hours. When medically stable (normal vital signs, electrolytes, and blood gases), the patient...
is transferred to a nursing care unit for SCI patients.

Depending on the type and severity of the injury, the patient remains immobilized in traction from 10 to 42 days (the average being 10 to 14 days), a period referred to as the premobilization phase. Odontoid or high cervical lesions may require longer immobilization; patients with gunshot wounds may require a shorter period of immobilization. Surgery and/or bracing are generally required to stabilize the spine before the patient is mobilized. The type of surgery and brace is determined by the physician according to the type and level of injury. Upon receiving the brace, the patient is transferred to a regular bed and may begin sitting as tolerated, a stage referred to as the mobilization phase.

**The Role of the Occupational Therapist**

All patients admitted to Northwestern's spinal cord unit are automatically referred to occupational therapy. Evaluation and treatment are initiated within 24 to 48 hours after admission. The immediate role of the therapist is to (a) provide the patient with a basic knowledge and understanding of the purpose and goals of the occupational therapy program; (b) facilitate the patient's ability to participate actively in his or her care; (c) provide the patient with the ability to control his or her hospital environment through specialized adaptive equipment such as a nurse call light, television controls, a telephone, or alternative communication devices; (d) provide adaptive equipment that the patient can use while on the Stryker frame or Rotorest bed to maximize independence in self-care; and (e) facilitate the patient's coping mechanisms and decrease his or her anxiety through the use of therapeutic activities and supportive counseling.

**Precautions/Considerations**

Several precautions are observed during the occupational therapy evaluation and treatment procedures. The primary consideration is to maintain the spine in the appropriate alignment. Patients with cervical injuries are not permitted to turn their heads; hence they must be approached within their visual field. Agitated, frightened, or confused patients are at the greatest risk for attempting to turn toward the examiner's voice.

Whenever resistance is applied to the upper extremity, proper stabilization techniques are closely adhered to. Postural alignment and pain are used as guidelines in moving the upper extremity through
extreme ranges of motion (ROM), in applying resistance for strengthening muscles, or in performing a manual muscle test. The patient on the Stryker frame is never given shoulder ROM or strengthening exercises while prone because this position may compromise the alignment of the vertebral column (prescribed in Northwestern Memorial Hospital’s “Protocol for Occupational Therapy Management,” prepared by J. Toerge and M. Braun, 1982).

In performing passive ROM with C6-injured patients, the long finger flexors are not overstretched because some tightness is needed for functional tenodesis. With these patients, finger extension ROM is carried out with the wrist flexed, and finger flexion ROM is carried out with the wrist extended.

Other considerations during evaluation or treatment are the patient’s limited visual field (due to traction or immobilization) and limited sensation. Clear, concise verbal directions are provided to compensate for the patient’s inability to heed visual cues in some positions. Clear directions help ensure a more accurate response and prevent the patient from experiencing undue frustration.

A final consideration concerns those patients with intravenous or arterial lines. When the needle site is at a joint, that joint must remain immobilized. When the site is not near a joint, ROM and strengthening activities are performed unless they reduce the flow of the medication.

Evaluation

The initial assessment includes a medical chart review and a personal interview to gain information about the patient’s current medical, physical, and cognitive status, as well as about his or her premorbid life-style (i.e., occupation, family life, and avocational interests). The therapist proceeds to assess upper extremity ROM, muscle strength, and sensation, as well as the orthoses and adaptive equipment needed. Passive and active ROM are measured while the patient is supine. Any joint deformities or limitations that may interfere with function are noted.

The procedure outlined by Rancho Los Amigos (3) is used for testing the strength of upper extremity muscles. This procedure follows a logical sequence of joints and muscles and specifies muscles by levels of innervation. With paraplegic patients, a dynamometer and pinch gauge are used to assess grip and pinch strength, and the Technical Manual—Hand Strength and Dexterity Tests (4) is used to compare the patient’s strength with the strength of normal subjects of the same sex and age.

In the sensory evaluation, pain, proprioception, and 2-point discrimination on the fingers only are assessed. Pain is tested by placing the sharp end of the safety pin on the T1 dermatome, then on proceeding dermatomes to the C5 level. Proprioception is tested proximally to distally. Any hyperesthesias, paresthesias, and dyesthesias are noted.

Criteria and guidelines for the evaluation and selection of wrist-hand orthoses, developed jointly by the occupational therapy staffs of Northwestern and RIC, are specified in Table 1. Indications for specific orthoses are determined by the grades of the wrist and finger muscles.

Activities of Daily Living

Both nurses and occupational therapists try to involve the patient in performing self-care activities as early as possible. Focus is placed on self-feeding and oral-facial hygiene while the patient is immobilized on the Stryker frame or Rotorest bed. The paraplegic patient is generally independent in these activities unless complications such as upper extremity fracture, brachial plexus injury, or head injury impair performance. The quadriplegic patient’s ability to perform these ac-

### Table 1

**Guidelines for Orthotic Selection**

<table>
<thead>
<tr>
<th>Splint</th>
<th>Criteria—Muscle Grades</th>
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<tbody>
<tr>
<td>Resting splint</td>
<td>(a) Wrist extensors 3/5 and below</td>
</tr>
<tr>
<td></td>
<td>(b) Wrist extensors 3+5 → 5/5</td>
</tr>
<tr>
<td></td>
<td>Finger movement 0/5</td>
</tr>
<tr>
<td></td>
<td>(c) Wrist extensors 3±5 → 3/5</td>
</tr>
<tr>
<td></td>
<td>Finger movement 1/5 → 3/5</td>
</tr>
<tr>
<td>Long opponens</td>
<td>Wrist extensors 3/5 or below</td>
</tr>
<tr>
<td>Short opponens</td>
<td>Wrist extensors 3±5 → 5/5</td>
</tr>
<tr>
<td>Short opponens with MP stop</td>
<td>Finger movement 0/5 → 3/5</td>
</tr>
<tr>
<td>RIC tenodesis</td>
<td>Wrist extensors 3±5 → 5/5</td>
</tr>
<tr>
<td>RIC tenodesis extension assist (rubber bands)</td>
<td>Intrinsic finger movement 1/5 → 3/5</td>
</tr>
<tr>
<td></td>
<td>Finger movement 0/5 → 3/5</td>
</tr>
<tr>
<td></td>
<td>Wrist extensors 3±5 → 5/5</td>
</tr>
<tr>
<td>Key: 5/5 normal; 4/5 good; 3/5 fair; 2/5 poor; 1/5 trace; and 0/5 zero.</td>
<td></td>
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</tbody>
</table>

The American Journal of Occupational Therapy 335
tivities is evaluated to determine both the setup and type of adaptive equipment required. The patient must demonstrate approximately $3+/5$ to $5/5$ strength in the deltoid and bicep muscles to initiate self-feeding or oral-facial hygiene. Also, the patient must demonstrate a functional hand-to-mouth pattern and sufficient endurance to complete a portion of a meal.

The patient on a Stryker frame performs self-feeding and hygiene while prone. The patient on the Rotorest bed is positioned supine and at a $45^\circ$ angle of sidelying. We have observed that patients on the Rotorest bed, regardless of level of injury, experience greater difficulties in performing self-care activities. The severe sidelying position is uncomfortable, and mirrors must be used for the patient to see the food tray. Patients may find the sidelying position intolerable, or they may find it difficult to perform an activity with the use of mirrors.

The therapist must recognize that these tasks may present difficulties in some positions and must avoid confronting a patient with these tasks if the experience will be frustrating and unsuccessful.

**Treatment**

Occupational therapy treatment is initiated within 48 hours of admission and is concurrent with evaluation. General goals for all quadriplegic patients in the pre-mobilization period are as follows: (a) to prevent the loss of upper extremity ROM; (b) to improve the strength of innervated muscles; (c) to maintain functional hand position with wrist-hand orthoses; and (d) to increase self-feeding independence. Upper extremity and ADL status are reevaluated upon mobilization because the patient may experience difficulty in performing activities in an upright, antigravity position. Additional treatment goals upon mobilization are self-care training in a sidelying or upright position and increasing physiological tolerance to an elevated head of bed (HOB) or sitting position.

The treatment activity emphasis for each level of injury (last innervated level) follows.

**C₄ Quadriplegia**

Introduce electrical equipment such as an electric page turner and counterbalance arm slings for upper extremity exercise.

**C₅ Quadriplegia**

Develop bilateral arm placement patterns and bilateral gross object manipulation. Independence in self-feeding is usually achieved prone on the Stryker frame with the following adaptive eating equipment: wrist support with utensil holder or long opponens splint with utensil slot, adapted bent utensils, plate guard, and long straw (see Figure 3). Independence in facial hygiene with setup is also possible by using a toothbrush in a wrist support or in the utensil slot of the long opponens splint. These skills are also practiced upright in the mobilization phase. Communication skills attempted include writing of names and filling out menus using a writing splint with wrist support and turning pages for reading using a pencil eraser held in place by a wrist support with a utensil slot.

Counterbalance arm slings may be necessary for the C₅ quadriplegic with weak deltoids as an interim measure during the acute phase.

**C₆ Quadriplegia**

Treatment for C₆ quadriplegia is similar to that listed for C₅ quadriplegia except that a utensil cuff is used instead of a wrist support/splint. A primary goal is independence in washing the face and the upper extremities using an adapted bath sponge. The activities of using a phone with an adapted holder, dialing with a pencil in a writing splint, turning television on and off with adapted controls, and typing on an electric typewriter are also initiated. Emphasis is also placed on developing a functional grasp and release pattern using tenodesis for object manipulation. An RIC tenodesis splint may be used to achieve a stronger pinch.

**C₇ and C₅ Quadriplegia**

The treatment is similar to that for C₆ quadriplegic; however, less adaptive equipment may be required. Built-up utensils facilitate independence in feeding, hygiene, and communication activities.

Paraplegia treatment in the pre-mobilization stage includes self-
feeding, brushing teeth, assisting with upper extremity bathing, and upper extremity strengthening. These activities are continued into the mobilization phase; exercises to increase sitting tolerance with the HOB raised to a 90° angle and to increase sitting balance are then added. Bed mobility skills, as well as upper and lower extremity bathing and dressing, are initiated prior to the transfer to a rehabilitation facility.

**Psychological Considerations**

Immediately after the injury, patients and their families are consumed with fear for the patient’s life. The psychodynamics of confronting a major disability emerge gradually as the life-threatening condition diminishes. We have observed coping mechanisms similar to those described by Kubler-Ross in *On Death and Dying* (5) in dealing with the unexpected shock of permanent or prolonged disability. Kubler-Ross’s phases of denial, anger, and bargaining are often observed during the acute care hospitalization, and the therapist makes an effort to intervene therapeutically. For example, the patient who exhibits denial requires consistent and supportive interactions. During evaluations the individual’s deficits and inabilities become evident and are discussed directly. Strengthening activities are usually pursued vigorously by these patients as they hope to gain full recovery. Exercises are presented in the context of strengthening viable muscles to substitute for non-functioning muscles. Participation in as many self-care tasks as possible is required. Adapted television switches, nurse call buttons, and water glasses enable the individual to experience an early sense of control in his or her restricted environment. This participation also establishes habit patterns of doing things for oneself.

Patients in the anger phase may refuse therapy, complain of intolerable pain, and demand constant assistance from others. It is particularly important for the family and health care team to persist in allowing and requiring the patient to be involved in his or her self-care. The discomfort imposed by surgery and/or immobilizing braces or traction should be addressed as a matter of course and not permitted as an excuse from treatment. Patients are encouraged to verbalize their anger, consider options, and make decisions. Explicit and repeated information about the benefits and outcomes of rehabilitation is provided to encourage the patient during this difficult phase. However, extreme care is taken to avoid portraying rehabilitation as a guarantee of “full recovery.”

Patients in the bargaining phase attempt to delay the confrontation with the inevitable reality. Although they often renew their efforts to engage vigorously in therapy, many develop fear and resentment toward “adaptive devices” and of entering a rehabilitation hospital or unit. The therapist assists the patient in this phase by continuing to require participation in problem solving, goal setting, and self-care, and by expanding treatment to include new achievements such as writing, turning pages, and dialing the phone. Gal and Lazarus (6) note the importance of an individual experiencing “personal effectiveness” as a means of coping with stressful situations. During this phase, success in as many self-care and communication tasks as possible is essential. Conversely, major setbacks may result when a patient is allowed to abandon self-care or is overly frustrated by poorly selected treatment activities.

Kubler-Ross’s (5) last two phases, depression and acceptance, are generally not evidenced during the acute care period of the SCI group, but these phases may appear later.

**Summary**

Self-care activities, orthotics, management, exercise, and psychological intervention for the acute SCI patient have been described. The early introduction of occupational therapy activities, together with a collaborative effort of all team members, provides SCI patients with the basic skills and preparation that they need to complete their rehabilitation process and return to community living.

**REFERENCES**