Standard of Care: Inpatient Occupational Therapy Intervention for Burns

ICD-9: 941-946 case specific to degree and location

Case Type / Diagnosis:

This standard of care applies to patients who are admitted to the Brigham and Women’s Hospital (BWH) Burn Unit. A burn injury can be sustained through a variety of sources including thermal/heat (flame, flash, scald, and steam), chemicals, radiation, sunlight, or electricity. A multidisciplinary approach is essential for acute burn care (Trombly, 1997). Burns can vary from a minor injury covering 1% of a patient’s body to a severe burn covering 90%-100% of the total body surface area. Over the last thirty years, medical technology and interventions have improved, increasing the survival rate of patients with large percentage burns (Herndon, 1996).

The following criteria categorize a burn that requires specialized inpatient burn center care:
- Partial thickness burns greater than 10% of total body surface area (TBSA)
- Burns involving the face, hands, feet, genitalia, perineum, or major joints
- Third degree burns
- Electrical burns, including lightning injury
- Chemical burns
- Inhalation injury
- Burn injury in patients with pre-existing medical disorders that could complicate management, prolong recovery, or affect mortality
- Any patients with burns and concomitant trauma (such as fractures) in which the turn poses the greatest risk of morbidity or mortality
- Burn injury in patients who will require special social, emotional, or long-term rehabilitative intervention (ABA Guidelines, 1999)

Severity of the burns is classified into the following categories and subcategories:

<table>
<thead>
<tr>
<th>Classification</th>
<th>Appearance</th>
<th>Area Affected</th>
<th>Sensation</th>
<th>Blanching</th>
<th>Wound Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Degree (Superficial)</td>
<td>Pink or red; May be dry or moist</td>
<td>Epidermis</td>
<td>Intact, painful</td>
<td>Present</td>
<td>Typically heals within 3-5 days with no scarring</td>
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<tr>
<td>Second Degree (Superficial partial thickness)</td>
<td>Bright pink or red, wet, blisters</td>
<td>Epidermis and portion of dermis</td>
<td>Intact, painful and sensitive to change in temperature and exposure to air or touch</td>
<td>Present</td>
<td>Heals by re-epithelialization in 10-14 days; typically no scarring or grafting needed</td>
</tr>
<tr>
<td>Second Degree (Deep Partial Thickness)</td>
<td>Mottled, red and waxy white; wet</td>
<td>Epidermis and deeper portion of dermis</td>
<td>Variable; may be intact with areas of diminished sensation</td>
<td>Diminished</td>
<td>Heals by re-epithelialization in 14-21 days or longer; scarring is likely if burn in &gt; 30% TBSA</td>
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<tr>
<td>Third Degree</td>
<td>White or tan; dry and leathery, non-pliable</td>
<td>Entire epidermis and dermis</td>
<td>Painless; may be sensitive to deep pressure; anesthetic to temperature</td>
<td>Absent</td>
<td>Skin graft required</td>
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<tr>
<td>Fourth Degree</td>
<td>May be charred or dry</td>
<td>Deep soft tissue damage to fat, muscle, tendon, fascia, and/or bone</td>
<td>Absent</td>
<td>Absent</td>
<td>Excision of necrotic tissue and skin graft required, possible amputation is some cases</td>
</tr>
</tbody>
</table>

**Phases of Burn Care:**
Burn management can be divided into three phases: (Trombly and Radomsky)

**Emergent or Resuscitative Phase**

**Acute Phase**

**Rehabilitative Phase**
Physical and occupational therapists are involved in all phases of burn care.

**Emergent or Resuscitative Phase Medical Goals:** (First 72 hours post-burn) (Trombly and Radomsky)
- Assess for the presence of an inhalation injury and secure airway
- Assess size of burn (total body surface area—TBSA) using the “Rule of Nines:”
  - Head = 9%
  - Trunk = 36%
  - Upper extremity = 9% each
  - Perineum = 1%
  - Lower extremity = 18% each
- Classify initial assessment of depth of burn
- Begin fluid resuscitation
- Maintain body temperature (prevent hypothermia)
- Achieve cardiopulmonary stability
- Establish adequate tissue perfusion and monitor for compartment syndrome (escharotomies may be necessary)
- Debridement of dead, dirty, or infected wounds

**Acute Phase Medical Goals:** (after emergent phase and until wounds are closed) (Trombly and Radomsky)
- Ongoing wound debridement, assessment for evolution of wound depth
- Skin grafting (when indicated)
- Infection control and rigorous wound care
- Nutritional support sufficient to meet wound-healing needs

**Rehabilitative Phase Medical Goals:** (follows acute phase until scar maturation)
- Surgical release of contractures
- Nutritional support
- Reconstructive or plastic surgery to maximize function and cosmesis

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Indications for Treatment:

- Patient population: patient with burn injury involving superficial, partial, or full thickness skin with potential extension into fascia, muscle, or bone, and at risk for contracture and scar formation.
- Impairments resulting from burns: joint mobility; range of motion (ROM); sensation; edema; pain; ventilation/aerobic capacity; endurance; balance/coordination; and strength.
- Functional deficits resulting from burns: functional mobility; loss of independence in performing activities of daily living (ADLs) and instrumental activities of daily living (IADLs); knowledge and understanding of condition; and coping/adjustment strategies following burn injury.

Contraindications / Precautions for Treatment:

- Hemodynamic instability:
  Patients who are in burn shock or multi-system organ failure may not be able to tolerate intervention without causing dangerous vital sign changes. Defer the treatment session, and re-assess the patient’s tolerance daily.

- Range of Motion (ROM):
  Precautions and restrictions must be known prior to starting each treatment session, due to one or more of the following reasons:
  - Skin grafts—involved joints are immobilized for 5-7 days
  - Biobrane dressings—ROM is deferred for 24-36 hours after application to allow dressing to adhere
  - Exposed tendons—specific ROM parameters must be given by the physician.

- Dorsal Hand Burns:
  Deep partial thickness or full thickness burns to the dorsum of the hand may damage the extensor apparatus, most critically over the proximal interphalangeal (PIP) joints of the digits. Potential central slip injury or disruption must be protected to minimize risk for the development of a Boutonniere deformity. Range of motion performed too early or aggressively can create or exacerbate a central slip disruption. These devastating functional sequelae necessitate a conservative, protective approach to deep dorsal hand burns. All such patients admitted to BWH burn trauma center with deep dorsal hand burns should be treated as having a central slip injury until proven otherwise.

- Pain Management:
  Plan treatment sessions to coincide with either pre-medication or the ability to receive bolus pain medication. Engage the patient and the staff in coordinating the optimal time for intervention with their pain.
control regime.

- Infection control:
  All staff must wear a gown, gloves, surgical mask, and hair net when working with a patient who does not have their wounds fully dressed. Gloves and a gown are required for any patient on Contact Precautions. It is necessary to practice excellent hand hygiene and cleaning of all equipment used during treatment.

**Evaluation:**

**Medical History:**

**Mechanism of injury**
- The extent of burn (TBSA, location, proposed degree of the burn)
- Evidence of an inhalation injury (singed eyebrows, nasal hairs, soot in sputum)—assessment often requires a bronchoscopy
- Joints which are crossed by the injury
- Medication relevant to the current medical status (i.e. need for pressors, fluid resuscitation, etc)

**Occupational Profile:**

Obtain social / environmental information from the chart, especially if the patient is intubated, confused, and / or family / friends are unavailable.

- Home environment, environmental barriers, DME used at home
- Family/caregivers involved prior to admission, and availability to assist upon discharge
- Prior to admission level in ADLs, IADLs, leisure interests, and vocational roles
- Daily routine including performance patterns and activity demands
  Patient’s goals and priorities for returning to daily occupations

**Analysis of Occupational Performance:**

**Motor Skills**
- ROM: Take active range of motion (AROM)/passive range of motion (PROM) measurements of bilateral upper extremities (UE)
- Strength: Assess bilateral UE strength (excluding shoulders)
- Sensation: Assess UE sensation for light touch, sharp/dull, and stereognosis
- Coordination: Assess manipulation of objects during functional activity, flow and coordination of movements, finger to nose testing of bilateral UE
- Functional Mobility: Assess functional transfers/mobility in patient’s room initially, usually from bed to chair when in ICU. Progress to higher level function as patient’s activity tolerance increases (indicate need for assistive device).
- Vision: Assess for functional acuity (including the need for corrective lenses at baseline), oculomotor tracking, and fields of view
• Activity tolerance/Endurance: Monitor vital signs for cardiovascular intolerance, shortness of breath (SOB) with exertion, rate of perceived exertion, and need for supplemental oxygen

**Process, Communication/Interactive Skills (Cognition and Communication):**

- **Cognition:** Assess level of arousal, alertness, orientation, (attention span—selective, sustained, divided), ability to follow commands, memory, ability to learn new information, problem solving, and insight into deficits. Assess the best mode of learning.
- **Communication:** Assess the patient’s ability to express and understand verbal or written material. Observe for patient’s ability to initiate communication or a response.

**Performance in areas of Occupation (ADLs, Education, Psychological and Affective):**

- **Activities of Daily Living (ADLs):** Assess self-feeding, grooming, hygiene, bathing, dressing, and toileting skills. Note the need for adaptive equipment or adaptive strategies in order to complete the task.

**Patient Factors**

- **Edema:** Assess the amount of edema present throughout the patient’s body (initially secondary to fluid resuscitation, then secondary to the inflammatory process). Use circumferential measurements to document edema.
- **Pain:** Assess the patient’s pain via the Visual Analog Scale (VAS) if they are verbal, or via observations of grimacing, changes in vital signs, resistance to motion in a non-verbal patient.
- **Vital Signs:** Check for the patient’s vital signs during the evaluation—blood pressure, O2 saturation, amount of O2, heart rate, and respiratory rate. If a patient is intubated, document the ventilator settings.
- **Skin Integrity:** Per the chart review and direct patient observation, the burn location and depth should be documented. If possible, note the stage of healing, exposed tendons, color, texture and status of the “take” of a graft. If appropriate, document the presence of scar formation.
- **Deep Dorsal Hand Burns:** For all patients admitted to BWH with deep dorsal hand burns, PIP and distal interphalangeal (DIP) joints should be immobilized in full extension splints at all times. The length of time an individual will need continuous interphalangeal (IP) extension splints will depend on a number of factors, the most important being the patient’s level of alertness. OT will be able to evaluate digit tendon integrity most accurately in patients who are able to actively participate in therapy.

**For patients who are alert and able to participate in OT evaluation:**

If the patient is awake and able to actively demonstrate intact digit extensor function, then gentle AROM only to P/DIP joints may be initiated via a “short arc motion” protocol. With the wrist flexed to 30 degrees and metacarpal phalangeal (MP) joints at 0 degrees (to reduce work requirement of the extensor digitorum communis (EDC), the patient actively flexes the IPs to 30 degrees. If the patient is able to fully extend the digit, then progress active flexion in 20-degree increments weekly.
IP extension splints are continued between ROM sessions. If an extensor lag develops at any time, resume full-time extension splint for 2 weeks, with subsequent re-evaluation and treatment per above. Extension splinting may be discharged once the patient achieves 60 degrees PIP flexion, provided they maintain full active extension.

**For patients who are sedated, or otherwise unable to participate in OT evaluation:**
In patients who are sedated, or otherwise unable to participate in OT evaluation of digit extensor function, continuous IP extension splinting is necessary to protect against further extensor apparatus damage. In most cases for sedated patients, this will be in a full resting hand splint with wrist extended to 45 degrees, MP joints flexed to 70 degrees, and IPs in full extension.

Gentle, isolated joint PROM to 45 degrees at P/DIPs may be initiated by OT to promote tension-free tendon gliding and minimize scar adherence. The wrist and MP joints are positioned in maximal extension during IP flexion PROM, to create slack on the extensor tendon mechanism. This protocol is continued for as long as the patient is sedated, or otherwise unable to actively demonstrate intact digit extensor function. At no time should OT perform full PROM digit flexion against soft tissue resistance.

As patients’ sedation is lightened, care must be taken not to allow a sudden, full active composite flexion of the digits, and risk re-injuring the delicate central slip. OT supervised progression of active IP flexion and full extension via the “short arc motion” guidelines above is initiated, with careful monitoring of continued full extensor function.

**For both alert and sedated patients:**
In both alert and sedated patients, full A/PROM of all other joints, including the wrist and MP joints, is initiated immediately, assuming no other injury would contraindicate ROM. Splinting of these joints between ROM sessions will be determined via general burn treatment principles.

- Psychological and affective: Assess the patient’s ability to cope with the pain, uncertainty, and trauma of their injury. Assess what roles, routines, and support systems enhance and limit the patient’s ability to engage in therapy sessions.

**Assessment:**

**Problem List:**
- Soft tissue deformity
- Potential for skin contracture/scarring
- Decreased performance in Activities of Daily Living
- Loss of range of motion
- Decreased functional mobility

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• Increased edema
• Impaired functional use of upper extremities
• Decreased knowledge for role of OT in burn care
• Impaired coping capacity
• Pain

**Prognosis and Expected Outcomes:**
The prognosis of each patient includes various factors, some positive and some negative:

*Positive:*
- No inhalation injury
- TBSA less than 50%
- Patient is younger than 50 years of age
- First or second degree burns
- Strong social/family network

*Negative:*
- Inhalation injury
- TBSA greater than 50%
- Patient is older than 50 years of age
- Third degree burns
- Pre-existing medical issues which prolong tissue healing (i.e. peripheral vascular disease, diabetes, tobacco use, poor nutrition)
- Presence of systemic infection

**Age Specific Considerations:**
Typically the patient population seen at Brigham and Women’s Hospital consists of adolescent, adult, and geriatric patients. Depending on the patient’s age, past medical history, and compliance with wound care regimes, the length of time for tissue healing will vary. A younger patient is expected to heal much quicker than a geriatric patient. Each patient’s treatment plan is devised specific to personal needs.

The psychosocial and community re-entry needs of these patients are often considerable. Age appropriate assessment of self-image, potential loss of vocational capacity, and potential loss of independence must be assessed according to the developmental level of each patient.

**Goals:**

*Short Term Goals:* anticipated to be met within 10 days. Appropriate goals include (but are not limited to):
- Prevention of or loss of skin integrity/contracture formation with the use of proper positioning and assistive/orthotic devices.
- Reduce edema to trace/minimal/moderate with proper positioning and compression as appropriate.
- Patient and their family will demonstrate being independent with exercise program.
• Patient will increase ROM measurements by 5-10 degrees in preparation for engagement in ADLs.
• Patient will be independent or require minimal/moderate/maximum assistance with self-feeding and grooming tasks using adaptive equipment as indicated.
• Patient will require supervision or minimal/moderate/maximum assistance with UE/LE dressing/bathing using long handled adaptive equipment as indicated.
• Patient will require supervision or minimal/moderate/maximum assistance with toileting.
• Patient/family will demonstrate independent/supervised/minimal assistance integrating education (positioning, adaptive strategies) into daily routine.

*Long Term Goals:* These goals are anticipated to be met after the patient has completed all occupational therapy services for this episode of care (including rehabilitation, home care, and outpatient services). Appropriate goals include (but are not limited to):
• Patient will be independent with all household and bathroom transfers.
• Patient will be independent with simple meal prep.
• Patient will be independent with all ADLs/IADLs.
• Patient/family will demonstrate independence with burn care and splint wear and care schedule.
• Patient will be independent in driving.
• Patient will be independent with scar management techniques.

*Treatment Planning / Interventions:*

*Interventions most commonly used for this case type/diagnosis include:*
• ADL retraining/Adaptive equipment
• Functional Mobility retraining
• Splinting/positioning
• Therapeutic exercise
• Patient/family education
• Edema control and scar management techniques
• Cognitive retraining (especially with trauma-related hypoxia)
• Visual retraining when damage to cornea exists
• Community re-entry activities
• Behavior management/psychosocial stimulation

*Frequency & Duration:*
To attain optimal functional return, patients are seen between 5-7 times a week. Occupational therapy is involved with a burn patient for their entire stay at BWH. After discharge, skilled OT is typically continued in an outpatient, home, or rehabilitation hospital setting.

*Patient / family education:*
Provide the patient and their family with education on the role of OT during the acute care hospital stay, the importance of initiating edema control and AROM in the healing process, splint
wearing schedule and how to care for the splint (when applicable), and an exercise program for involved extremities.

Once burn areas have started to close, scar management issues and compression garments are addressed with the patient and family. Emphasis is placed on understanding the mechanisms that cause scar formation, the need for excellent compliance with scar management interventions, and the potential loss of function should scarring occur.

**Recommendations and referrals to other providers:**
Within the acute care setting, there are many disciplines involved. Physical therapy, care coordination, social work, nutrition, speech/swallow, orthopedic technology, and psychiatry services are provided to the severely burned patient.

During the inpatient stay at BWH, burn patients may be benefit from a visit from a burn survivor. The Phoenix Society (Boston Chapter), has a volunteer who sustained severe third degree burns over 90% of his body decades ago. The Social Work service can arrange for a patient to receive a visit or visits from this volunteer (called the SOAR program), to provide encouragement and to serve as a healthy role model during their hospitalization.

**Re-evaluation / Assessment:**
Patients are re-evaluated every 7-10 days to provide a current functional status and to update their STGs. If STGs are not being met, the factors limiting progress should be identified in the documentation.

**Discharge Planning:**
Discharge planning begins on the day of admission. Some burn patients may only be hospitalized for 2-3 days (for pain management, wound debridement, and infection prophylaxis). Patients with large or deep burn injuries will likely require several weeks of acute hospitalization, and then on-going rehabilitation for up to one or two years. Important factors for a successful discharge plan include a patient’s compliance with intervention, available family/social supports, and adaptive coping skills.

Once patients are medically stable and discharged from the hospital, they are encouraged to join a support group for burn survivors to assist with coping skills and community re-entry.

**Transfer of Care:**
Upon discharge from BWH, an occupational therapy referral evaluation is sent with the patient to their next provider. The patient’s current status and goals are included to facilitate a smooth transfer of care. The future care providers can be found in multiple settings: home, outpatient, and/or rehabilitation facility. Whenever possible, patients with serious hand burns should be referred to a certified hand therapist (CHT) upon discharge.
**Patient’s Discharge Instructions:**
At time of discharge, patients receive a written copy of their current exercise program, splint schedules, and how to care for the splints. It is essential to educate the family and the patient on strategies to promote their independence in ADLs as they return to an out-of-hospital context.

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