Standard of Care: Wound Care/Integumentary Management
Physical Therapy management of the patient at risk for or with an integumentary disorder.

Case Type / Diagnosis:
This standard of care will provide guidelines for the management of patients who are at risk for integumentary disruption or who present with partial or full thickness wounds and would benefit from physical therapy intervention. Integumentary management utilizes prevention techniques, as well as direct wound care interventions to promote wound healing. Wound management is a comprehensive team approach that includes procedures used to achieve a clean wound bed and eliminate infection, promote a moist wound healing environment, facilitate autolytic debridement, enhance perfusion and nutrient delivery to the tissues, and protect the wound bed during the healing process. This may involve care during one or all three phases of wound healing (inflammatory, proliferative, maturation), including the management of resulting scar tissue.

This standard will focus on patients at increased risk for impaired skin integrity as well as the following types of integumentary disorders:

- Pressure Ulcers (ICD-9: 707.0, 707.8)
- Venous Stasis Ulcers (ICD-9: 443, 454.0, 454.2, 459)
- Arterial Insufficiency Ulcers (ICD-9: 443, 459)
- Diabetic Neuropathic Ulcers (ICD-9: 250, 707.1)
- Surgical wounds and grafts (excluding amputations and burns) (ICD-9: 998.3)

For detailed information regarding the management of a burn or an amputation patient, please refer to the respective Burn or the Lower Extremity Amputation Standard of Care (SOC) as neither diagnosis will be specifically covered in this document.

Indications for Treatment:
The specific practice pattern identified in this SOC is the complete Integumentary Practice Pattern. This encompasses the primary prevention and risk reduction for integumentary disorders and impaired integumentary integrity associated with superficial, partial-thickness, and full-thickness skin involvement. The APTA’s Section on Clinical Electrophysiology and Wound Management and Guide for Integumentary/Wound Management Content in Professional Physical Therapist Education is an excellent and comprehensive resource that will certainly help both the novice and more experienced clinician cultivate his/her skills during this process. This document from the APTA provides an outline of the necessary contextual background to assist with fully understanding tissue healing and expected outcomes as well as determining and
Contraindications / Precautions for Treatment:
Depending on the etiology of the integumentary disorder, the specific contraindications and precautions may vary. Please refer to the specific orders in the computer/patient chart or discuss with the appropriate/consulting service (i.e. Plastics or Vascular) if questions regarding the details of an individual patient’s care arise.

For patients with an elevated International Normalized Ratio (INR) of greater than or equal to 3.5, please consult the physician or nurse practitioner prior to initiating mobility.4

The following precautions and/or contraindications have been identified and discussed with the BWH medical staff and stand as the general precautions for the below noted patient situations. These guidelines should be maintained unless otherwise stated in the physician orders.

- **For split thickness skin graft (STSG) or full thickness skin grafts (FTSG)** that involve the lower extremity a patient can be expected to remain on bedrest for five (5) days. To prevent shearing or injury to the new graft, no range of motion of the affected limb is allowed until notified by a physician or nurse practitioner. The above information is applicable whether or not a graft crosses a joint. It is likely that a graft that does cross a joint will warrant further immobilization of the involved joint (i.e. with a knee immobilizer or resting foot splint) to prevent any ROM. Specific weight bearing precautions should be identified with the primary team prior to mobilization. Depending on the site of the graft or the wound, the patient may be non-weight bearing, partial weight bearing, heel weight bearing, forefoot weight bearing, or even weight bearing as tolerated.

- **For donor sites**, there is no specific activity, ROM or weight bearing restrictions, although some patients may be more limited by comfort level. Generally the donor sites will be dressed with either Tegaderm™ or Xeroform™ and this dressing should remain in place until it falls off or is taken off by a physician. When mobilizing a patient, it may be necessary to reinforce a Tegaderm™ dressing with Kerlix™ if leaking occurs. However, do not tape the Kerlix™ directly to the Tegaderm™ or leave the Kerlix™ in place once mobilization is complete.

- **Vacuum assisted closure (VAC)** therapy can be used over grafts and directly on wounds to promote healing. If over a graft, the same precautions as listed above are applicable. Check with a physician prior to initiating mobility and/or ROM as well as for specific weight bearing precautions (if any). If the VAC is used over a wound then there should not be any additional activity precautions except for the identified weight bearing precautions. However, it is critical to ensure that the VAC remains on suction (i.e. use of the battery) if the patient is ambulating.
Please note: At this time, the current VAC system used at BWH automatically transitions to battery power when unplugged from the outlet.

In this acute care setting, it is important to note that some guidelines may be different among surgeon/physician given his/her preferred technique or practice. Therefore it is necessary to refer and adhere to that physician’s orders/guidelines for appropriate patient management.

Precautions with modalities: Please refer to the Pulsed Lavage Procedural Guidelines for contraindications/precautions with that particular modality as well and the Surgical Standard of Care for considerations with surgical incisions.

**Evaluation:**

**Chart Review**

**History of Present Illness (HPI) and Past Medical History (PMH)**
- Reason for admission
- Onset and duration of symptoms including mechanisms of injury
- Previous or current medical and/or surgical treatments
- PMH with specific attention to a history of diabetes, peripheral vascular disease, coronary artery disease, congestive heart failure, spinal cord injury, malnutrition, and a history of smoking

**Social History**
- Prior functional level, use of assistive devices and/or adaptive equipment
- Home environment and current/potential barriers to returning home
- Family/caregiver support system
- Family, professional, social, and community roles
- Patient’s goals and expectations of returning to previous life roles

**Hospital Course**
- New or ongoing medical intervention
- Pertinent lab values (i.e. White Blood Count (WBC), Hematocrit (Hct), INR, albumin, glucose)\(^\text{19}\)
- Diagnostic testing (i.e. X-ray or MRI for osteomyelitis, angiography for circulation, doppler ultrasound)
- Overall nutritional status\(^\text{18,22}\)
- Other Consults: Plastics, Vascular, Ostomy Nurse, Nutrition

**Medications**

Given that integument issues can arise in any patient determined to be at risk for skin breakdown or potential healing issues, patients may be treated with numerous pharmacological agents that may vary greatly among the individual patients.
Common medications can include antibiotics for local or systemic infections, topical medications, narcotics for pain management, nutritional supports such as total parenteral nutrition (TPN), or possibly insulin for optimal diabetic management should diabetes exist as a comorbidity.

**Examination**

This section is intended to capture the most commonly used assessment tools for this case type/diagnosis. It is not intended to be either inclusive or exclusive of assessment tools.

- **Anthropometric Characteristics** including edema (circumferential measurement versus pitting edema scale)
- **Vitals signs**- Heart Rate, Blood Pressure, Respiratory Rate, Oxygen Saturation
- **Circulation** including capillary refill, Ankle-Brachial Index (ABI)\(^2\), superficial vascular responses. The ABI may be documented in the physician’s admission note or in the patient’s history but if not available in the chart this measurement may be done by a therapist.
- **Sensory integrity** including light touch, sharp/dull, deep pressure, vibration, temperature, presence of paresthesias or neuropathy. Semmes-Weinstein monofilament testing is especially useful in assessing a diabetic wound\(^1\).\(^7\)
- **Skin integrity**\(^6\)- presence of skin breakdown and full wound assessment that includes location, size, shape, odor, drainage, presence of tunneling or undermining, exposed anatomical structures, presence of devitalized tissue or granulation tissue; should also include stage of the wound if a pressure sore or characteristics of the incision (if a surgical patient). Please refer to Appendix 1 “Wound Assessment Handout/Worksheet” in the Integument Resource Manual for further details.
- **Skin Characteristics**- trophic changes such as thickened nail beds, calluses, shiny or dry skin, skin color, hair growth, texture, pliability, temperature, recent or old scarring from prior/healed ulcers, evidence of infection
- **Pain**\(^1\)- location, type, intensity, use of visual analog scale (VAS), pain at rest, pain with dependent positioning
- **Range of Motion** including passive/active assisted and active range of motion (P/AA/AROM) as well as presence of contractures or deformities
- **Strength**
- **Neurological function** including abnormal tone
- **Postural alignment and bony prominences**
- **Gait**
- **Functional Mobility**: bed mobility, transfers, ambulation, stairs
- **Mental Status/Cognition**: level of consciousness/alertness, orientation, ability to follow commands, knowledge of pathology, safety awareness
- **Risk Assessment Scales**: Braden Scale\(^7,10,12,21\), Norton Scale\(^12,21\)

Please note: At BWH, the Braden Scale is usually completed by a nurse for all patients upon admission on the Nursing Assessment Form.

Standard of Care: ___Wound Care________________
Assessment:

The primary goal when addressing this population is to provide an individualized and integrated plan of care which minimizes risk for further integumentary disruption, promotes wound healing, and maximizes mobility, thus allowing patients to return to their highest level of functioning in home, work, and community environments. Secondary goals are to serve as a resource for both patient and family and to assist with the discharge and referral process.

Potential impairments include, but are not limited to:

- Impaired skin integrity
- Impaired sensation
- Impaired circulation
- Edema
- Impaired ROM
- Impaired strength
- Impaired balance
- Impaired motor function
- Impaired tone
- Impaired functional mobility including bed mobility, transfers, ambulation
- Impaired endurance and activity tolerance
- Impaired mental status (cognition, arousal, attention, memory, barriers to learning)
- Pain

The predicted outcome for this patient population is to maximize their skin integrity and ability to return to their previous life roles as well as the reduced risk of developing integumentary disorders. The ability to achieve this outcome is shared by a team and the steps taken may include the debridement of devitalized tissue, infection and inflammation control, nutrient delivery to the tissues as well as the body’s overall nutritional status and the promotion of wound healing. This will also involve using the appropriate physical therapy intervention, modality, assistive device, orthotic, and/or adaptive equipment, as each patient’s individual needs dictate.

The rehabilitation prognosis may be modified by any of the following factors:

- Nature and extent of pathology
- Ongoing and/or active medical treatment or surgical intervention
- Presence of comorbidities or secondary impairments
- Overall health and nutritional status
- Barriers to returning to previous living environment
- Patient compliance or adherence to the intervention program
- Patient’s coping mechanisms to altered functional status, anticipated disease process, cosmetic/body image issues, and pain issues
- Teaching and learning considerations
- Patient’s own goals

Standard of Care: Wound Care
Goals should be measurable and individualized for each patient, taking into consideration the patient’s status and their own goals. Timeframes will vary based on the extent of the integumentary disruption and the patient’s current status and functional level. Suggested goals may include:

- Reduce the risk/prevent skin breakdown
- Reduce necrotic tissue in the wound bed (i.e. debridement)
- Promote wound granulation
- Reduce edema in the extremities
- Promote good circulation
- Promote sensory awareness and good skin care habits
- Maximize ROM of upper and lower extremities
- Maximize strength
- Maximize independence with functional mobility
- Maximize patient knowledge, participation, and compliance with the prescribed program

**Treatment Planning / Interventions**

<table>
<thead>
<tr>
<th>Established Pathway</th>
<th>___ Yes, see attached.</th>
<th><em>X</em> No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Established Protocol</td>
<td>___ Yes, see attached.</td>
<td><em>X</em> No</td>
</tr>
</tbody>
</table>

**Interventions most commonly used for this case type/diagnosis.**

This section is intended to capture the most commonly used interventions for this case type/diagnosis. It is not intended to be either inclusive or exclusive of appropriate interventions.

Prevention of integument issues is in itself as much of an active intervention as the below noted hands-on techniques. Identifying those patients at risk based on past or current medical history and educating them on the principles of good skin care is paramount in the primary prevention of developing a wound that will ultimately require medical attention.

Once a disruption in skin integrity occurs, no matter the etiology, successful healing is largely based on the ability to relieve pressure from the affected area, ensure and/or restore adequate arterial blood flow to the area, and treat infection of the soft tissue via by debridement and/or antibiotics⁵.
Physical Therapy intervention is focused on the following:

- **Improve/Prevent Alteration in Skin Integrity**
  - Positioning to prevent excessive/prolonged pressure
  - Mobility techniques to minimize shearing and friction on the skin
  - Prescription of air mattresses, seating cushions, and resting splints to relieve pressure. For example, Rolyan™ foot drop splints can be obtained directly in the PT department; Multi-Podus boots® can be ordered from Compass Healthcare, a local medical equipment vendor.
  - Prescription of splints/orthotics for appropriate weightbearing and pressure relief/off-loading of an involved limb. Although BWH readily stocks post-op shoes for both heel and forefoot weight bearing, the key to reducing repetitive trauma and pressure on an existing wound to allow healing is use of total contact casting (TCC)\(^1\). In some cases the use of a reinforced walking boot rendered irremovable or use of a posterior walking splint can be used instead of a full cast\(^1\). All 3 of these devices do need to be applied by a trained and knowledgeable clinician (i.e. PT, ortho tech, physician, nurse practitioner). To date the gold standard for sustainable off-loading and treatment of diabetic neuropathic foot ulcers is total contact casting\(^5,14,20\). However, appropriate consideration needs to be given in the acute care environment prior to use of TCC given the nature of acute wounds, prevalence of infection and potential for increased edema. The wound may need to be more accessible than total contact casting allows for frequent assessment and/or treatment.

Please refer to Appendix 2 “Splints available for use on Inpatients” and Appendix 3 “Algorithm in lower extremity splinting in patients with potential for active skin issues” to assist in the decision making process when choosing an appropriate device. The main issues to consider when choosing a splint include level of functional mobility and the need for protection, pressure relief, and joint/limb immobility.

- **Edema Management**
  - Exercise/AROM/PROM
  - Positioning/elevation (especially for venous stasis ulcers)
  - Compressive bandaging (i.e. TEDS, ace wrap) - for venous stasis ulcers\(^9,17\)

- **Therapeutic Exercise**
  - Exercise program to include supine, sitting, standing P/AA/AROM for bilateral upper and lower extremities, as appropriate
  - Progress intensity, frequency, and duration
• Endurance Training
  o Increase out of bed tolerance
  o Progress time, distance, frequency of ambulation
  o Recommend appropriate activity schedule to patient, other healthcare providers, and family members

• Gait Training
  o Pre-gait activities
  o Gait training for patients with weight-bearing restrictions
  o Gait training for patients with gait abnormalities
  o Assistive device prescription, as appropriate

• Functional Mobility Training
  o Bed mobility: rolling side-to-side, supine-to-sit, sit-to-supine
  o Transfers: bed to chair, wheelchair, commode
  o Ambulation
  o Stair training

• Pain Management\textsuperscript{11}
  o ROM
  o Positioning
  o Relaxation
  o Pain medications as prescribed by physician

• Modalities- for mechanical debridement and direct wound care\textsuperscript{13,15,16,17,21,23}
  o Whirlpool
  o Pulsed Lavage
  o Ultrasound (used for the reduction of inflammation and the promotion of the proliferative phase of healing including scar management)
  o Electrical Stimulation/Iontophoresis
  o Vacuum-Assisted Closure (VAC)
  o Hyperbaric Oxygen

Of the above listed modalities, pulsed lavage is the only modality the BWH physical therapists use on a regular basis. Please refer to the Rehabilitation Department’s procedure for full details on performing pulsed lavage on inpatients. This modality replaces its hydrotherapy predecessor, the whirlpool, as it has shown itself to be a more beneficial, efficient, and cost effective form of hydrotherapy intervention in the acute care setting\textsuperscript{16}. Although ultrasound\textsuperscript{13,22,23} and electrical stimulation\textsuperscript{13,15,22} may have demonstrated some laboratory results, further clinical evidence and well-controlled studies specifically addressing efficacy in the acute care population may be needed for selected use of these modalities. It is possible that these modalities may be more beneficial in the later stages of healing and thus not often selected at BWH given our primary goals of eliminating infection and promoting a clean wound bed via debridement. VAC is
widely used at BWH as a reliable form of adjuvant therapy but is under the direct responsibility of the physicians. Hyperbaric oxygen may also be effective for the healing of certain wounds but overall is a very costly modality and not widely used given the lack of availability or accessibility to the hyperbaric chamber.\textsuperscript{13

There are wound management interventions that our physical therapy department is not directly involved in but are performed in the acute care setting by other team members (i.e., physicians and nurses). These include appropriate dressings, autolytic debridement, sharps or surgical debridement, and use of the VAC. Other than iontophoresis, any other type of medicated wound care is done by a nurse or a physician. For specific wound care products and dressings used at BWH for pressure sores please refer to the Nursing Care Practice Manual.\textsuperscript{3} For a more general guide to topical antiseptics, antifungals, and antibiotics as well as a reference guide to wound care product categories please refer to Appendix A and B in Sussman and Bates-Jensen’s book entitled \textit{Wound Care}.\textsuperscript{22

Patient / Family Education

- Instruct patient/family/caregiver in following:
  - Pressure relief and appropriate positioning
  - Appropriate skin care and frequent skin checks
  - Smoking cessation
  - Independent therapeutic exercise, ROM, and endurance programs
  - Safe mobility techniques (including precautions), activity progression, encouraging maximal independence
- Discuss realistic expectations regarding wound healing, functional level, appropriate level of assist required by patient, anticipated rehabilitation progression
- Provide emotional support to patient and family as needed
- Consider a patient’s learning style for most effective communication and instruction

Frequency & Duration

Patients will have follow-up physical therapy treatments based on individual need. The frequency of treatment for each patient will be determined by the acuity of his/her impairments, functional limitations and the intervention chosen. Please refer to the \textit{BWH Guidelines for Frequency of Physical Therapy Patient Care in the Acute Care Hospital Setting}\textsuperscript{4} as well as the Pulsed Lavage Procedural Guidelines for further direction, taking into consideration that frequency and duration will be dependent upon the chosen intervention and goal(s) of intervention.
A patient may benefit from intervention from the following services or clinician:

- Occupational Therapy
- Nutritionist
- Ostomy Nurse
- Care Coordination
- Social Work

**Re-evaluation**

Re-evaluations are to be performed under the following circumstances: all physical therapy goals are met, a significant change in medical status occurs, the patient is discharged from services or the facility, and/or the patient fails to respond to physical therapy intervention. A re-evaluation should be performed at least once every ten days. Ongoing wound assessment will determine the necessity of pulsed lavage intervention but please refer to the Pulsed Lavage Procedural Guideline for tips on when the discontinuation of the above modality may be warranted.

**Discharge Planning**

Discharge planning occurs on an individual basis, depending on the patient’s medical, physical, and social needs. Discharge planning is a coordinated effort that occurs with the physician, nurse practitioner, nursing staff, care coordinator, physical and occupational therapists, and the patient and his/her family.

If the patient continues to have significant impairments and functional limitations and/or ongoing medical or wound care needs at the time of discharge from the acute care facility, the patient may be discharged to an extended care facility (i.e. an acute or sub-acute rehabilitation facility or skilled nursing facility). The patient will continue to progress towards the physical therapy goals at this inpatient facility, as appropriate.

If the patient has met all inpatient physical therapy goals and the wound care needs can be managed in a home setting, the patient may then be discharged home with or without services. Consider the following resources for continued wound care management, therapy and/or services:

- Visiting Nurse Association (VNA) to include home nursing and home PT
- Outpatient PT

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REFERENCES


2. APTA’s Section on Clinical Electrophysiology and Wound Management Guide for Integumentary/Wound Management Content in Professional Physical Therapist Education

3. BWH Nursing Care Practice Manual

4. BWH Guidelines for Frequency of Physical Therapy Patient Care in the Acute Care Hospital Setting: Integumentary Practice Pattern.


Standard of Care: _Wound Care_


## Appendix 1: WOUND ASSESSMENT

<table>
<thead>
<tr>
<th>Clinical Parameter</th>
<th>Slight</th>
<th>Mild</th>
<th>Moderate</th>
<th>Moderate/Severe</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maceration:</td>
<td>Yes</td>
<td>No</td>
<td>Shape: __________________________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edges</td>
<td>none clear visible</td>
<td>outline visible, attached, even with wound base</td>
<td>well defined, not attached to wound base</td>
<td>as previously, edges rolled under thickened</td>
<td>well defined, fibrotic, scarred, hyperkeratotic</td>
</tr>
<tr>
<td>Undermining</td>
<td>&lt;2cm</td>
<td>2-4cm involving &lt;50% of wound</td>
<td>2-4cm involving &gt;50% of wound</td>
<td>&gt;4cm any area</td>
<td>tunneling &amp;/or sinus track formation</td>
</tr>
<tr>
<td>Type of Necrotic Tissue</td>
<td>none</td>
<td>white/gray or yellow slough</td>
<td>loosely adherent yellow slough</td>
<td>adherent soft black eschar</td>
<td>firmly adherent hard black eschar</td>
</tr>
<tr>
<td>Extent Necrotic Tissue</td>
<td>none</td>
<td>&lt;25% wound bed</td>
<td>25-50% wound bed</td>
<td>51-74% wound bed</td>
<td>75-100% wound bed</td>
</tr>
<tr>
<td>Exudate Type</td>
<td>none or bloody</td>
<td>serosanguinous, thin, watery, pale, red/pink</td>
<td>serous, thin, watery, clear</td>
<td>purulent, thin or thick, opaque, tan/yellow</td>
<td>purulent, thick, opaque, yellow/green with odor</td>
</tr>
<tr>
<td>Exudate Amount</td>
<td>none</td>
<td>scant</td>
<td>small</td>
<td>moderate</td>
<td>large</td>
</tr>
<tr>
<td>Surrounding Skin Color</td>
<td>pink/normal</td>
<td>bright red or blanches to touch</td>
<td>white or gray, pallor or hypo-pigmented</td>
<td>dark red or purple and/or non-blanchable</td>
<td>black or hyper-pigmented</td>
</tr>
<tr>
<td>Peripheral Tissue Edema</td>
<td>minimal firmness around wound</td>
<td>non-pitting edema extends &lt;4cm around wound</td>
<td>non-pitting edema extends &gt;4cm around wound</td>
<td>pitting edema extends &lt;4cm around wound</td>
<td>crepitus &amp;/or edema extends &gt;4cm around wound</td>
</tr>
<tr>
<td>Extent Granulation Tissue</td>
<td>skin intact or partial thickness</td>
<td>bright beefy red, 75-100% of wound filled &amp;/or tissue overgrowth</td>
<td>bright beefy red, &lt;75% and &gt;25% wound filled</td>
<td>pink &amp;/or dull, dusky red &amp;/or fills &lt;25% of wound</td>
<td>no granulation tissue present</td>
</tr>
<tr>
<td>Epithelialization</td>
<td>100% wound covered</td>
<td>75-100% covered &amp;/or epithelial tissue extends &gt;.5cm into wound bed</td>
<td>50-75% covered epithelial tissue extends &lt;.5cm into woundbed</td>
<td>25% to less than 50% wound covered</td>
<td>&lt;25% wound covered</td>
</tr>
</tbody>
</table>
Appendix 2: Splints available for use on inpatients:
The main 4 main goals of splinting include maintaining a specific level of functional mobility and the need for protection, pressure relief, and joint/limb immobility. Each of the below noted splints used at BWH focuses on 1 or more of these goals.

1. Is the splint used in bed only?

   - Rolyan™ foot drop splint
     - Indications: **Pressure relief and positioning**; used to prevent foot drop in the sedated and/or weak patient by keeping the foot in a neutral position
     - Pros: stocked in the PT department, comes in 2 widths: regular and extra wide to accommodate for a large extremity, significant edema, extensive dressings, etc; blue padding can be cut or modified, prevents internal/external rotation of the LE
     - Also comes as an **adjustable foot drop splint** to accommodate patients who cannot get into neutral right away whether from a plantarflexion contracture or have ROM precautions (i.e. no dorsiflexion) following a surgical procedure
     - Cons: splint is bulky, difficult to use in sidelying, cannot be used for standing or ambulation, difficult to use in patients with hypertonicity and/or spasms
     - How to Obtain: order in computer under “Ortho Tech” if just need splint; can also go under PT order if active PT is needed

   - Foot Drop Positioner (Foam)
     - Indications: **Pressure relief**; used in supine to prevent pressure on heel and/or calf as well as prevention of foot drop
     - Pros: soft and easy to don/doff; can modify/cut to avoid pressure on specific areas of the LE, latex-free
     - Cons: not effective in use of patients with hypertonicity
     - How to Obtain: floor can call the Service Center to obtain

   - Tib-Fib Splint
     - Indications: **Pressure relief**; used in supine only to prevent foot drop
     - Pros: edges can be modified with a cast saw
     - Cons: runs narrow so not good for a larger or edematous LE, not as much padding as the Rolyan or a multi-podus, does not prevent internal/external rotation of the LE
     - How to Obtain: order in computer for Ortho Tech

   - Multi-podus Boots®
     - Indications: **Pressure relief, Protection, Activity**; also used for foot drop as well as limb protection due to its sheepskin padding; often used with vascular patients or for those patients who need additional padding (i.e. patients with heel decubitus ulcer)
2. **Is your patient ambulatory (with or without weightbearing precautions)?**

- **Post-op Shoe (flat)**
  - Indications: **Protection, Activity**; often used in patients with ulcers or who have undergone vascular surgery and/or toe amputation and need protective footwear to ambulate; promotes heel weightbearing
  - How to Obtain: Ortho tech or PT order in computer; generally also need to know a patient’s weightbearing status

- **Heel Weightbearing Boot (post-op shoe with significant heel lift)**
  - Indications: **Protection, Activity**; as above with post-op shoe but strongly promotes heel weightbearing during ambulation
  - Precautions: given the height of the heel lift, need to assess a patient’s balance as this can causes a discrepancy in leg length affecting pt’s balance and gait
  - How to Obtain: as above with Post-op shoe

- **Forefoot Weightbearing Boot**
  - Indications: **Protection, Activity**; as above with post-op shoe but promotes forefoot weightbearing
  - How to Obtain: as above with post-op shoe

- **Aircast Walking Boot**
  - Indications: **Immobility, Activity**; used to immobilize ankle in neutral while allowing weightbearing, generally used in orthopedic injuries, can also be used for positioning
  - Pros: comes in 2 lengths: short (mid-calf), and long( just below the knee), can adjust the air cushions inside the splint for more/less contact
  - Precautions: Skin issues/pressure sores due to total contact
  - How to Obtain: ortho tech order in computer

- **Pre-fab Ankle Foot Orthotic (AFO)**
  - Indications: **Activity**; Used to assist/support the foot for ambulation; generally used for a patient with foot drop (from nerve damage, stroke, etc) or LE weakness
  - Pros: stocked in the PT department, can begin gait training inhouse if patient has the appropriate footwear to use with this orthotic
  - Cons: These are minimal resistance AFOs (trimline posterior to the malleoli) and do not usually provide sufficient inversion/eversion control if this is lacking. If hypertonia is present this may not provide sufficient support in maintaining neutral position. If inadequate knee control is present they may not prevent knee buckling
-Precautions: should do frequent skin checks in patient with existing skin integrity issues or with impaired sensation.

-How to Obtain: PT Consult- BWH stocks pre-fabricated ankle foot orthotics. If the in stock version does not accommodate the patient, first consult the orthotist for an upgraded version of the pre-fab splint. If significant issues are present and the patient is not be able to be properly fit with a pre-fab or an upgraded version of the pre-fab then a custom fit may be required by the outside orthotist. This requires casting of the LE to make a custom molding of a splint.

- Total Contact Casting (TCC)
  - Indications: Immobility, Pressure Relief; use for pressure relief and/or sustained off-loading of an involved limb (especially in the treatment of diabetic neuropathic foot ulcers)
  - Pros: gold standard for the treatment of diabetic neuropathic foot ulcers to allow for healing; can ambulate with this cast if a cast boot is applied over the cast itself
  - Cons: limited access to the wound since it should stay in place 5-7 days for maximal effect
  - How to Obtain: must be applied in conjunction with ortho tech or MD as a cast is placed on the patient

- Bivalve Cast
  - Indications: Immobility, Pressure Relief; as above with total contact casting except that the cast can be removed for dressing changes, etc; the posterior portion of the cast can also be used as a resting splint in supine
  - How to Obtain: Ortho tech order to place bivalve cast

Created 6/09
Appendix 3: Algorithm for Lower Extremity splinting in patients with the potential for or with active skin issues

Is the pt bedbound or non-ambulatory?

Yes
  Does the pt transfer bed to chair only?
    Yes
      Consider:
      Multi-podus boot with removable foot plate
    No
      Consider:
      Rolyan Foot Drop Splint
      Foam Foot Drop Positioner
      Tib Fib Splint
    
  No
    Does the pt need protective footwear?
      Yes
        Consider:
        Post-op Shoe
        Heel Weightbearing Shoe
        Forefoot Weightbearing Shoe
        Multi-podus w/ ambulatory plate
      No
        Consider:
        Aircast Walking Splint
        Pre-fab afo
        Total Contact Cast
        Bivalve Cast
    
    Does the Splint need to be adjustable?
      Yes
        Consider:
        Aircast Walking Boot
        Total Contact Casting (TCC)
        Bivalve Cast
      No
        Consider:
        Pre-fab afo if foot drop is present
        Foam Foot Drop Positioner can be cut to relieve pressure
        Tib Fib splint can be cut with cast saw
    
  Do specific areas of the limb need pressure relief or sustained offloading?
    Yes
      Consider:
      Aircast Walking Boot
      Total Contact Casting (TCC)
      Bivalve Cast
      (Of note: place cast boot over casts for ambulation)
    No
      Consider:
      TCC
      Bivalve Cast

Of Note: Consider these potential weightbearing orders: FWB/WBAT, PWB, NWB, heel weightbearing, forefoot weightbearing