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continued

continued



Acute Care Back to the Basics Virtual Conference

Guest Editors: Lyndsay Laxton, OTR/L;
Meghan Morrow, OTR/L

continued

Acute Care Back to the Basics Virtual Conference

- | | |
|------------|--|
| Mon 2/17 | Acute Care Back to the Basics: Vision
Assessment and Management
Leah Muntges, MOTR/L |
| Tues 2/18 | Acute Care Back to the Basics: OT's Role in
Critical Care
Lyndsay Laxton, OTR/L
Meghan Morrow, OTR/L |
| Wed 2/19 | Acute Care Back to the Basics: Burn Care
Julia Smith, MS, OTR/L |
| Thurs 2/20 | Acute Care Back To The Basics: OT's Role In The
Emergency Department
Lyndsay Laxton, OTR/L
Katie Freeman, MSOT, OTR/L |
| Fri 2/21 | Acute Care Back to the Basics: Gerontology
Marianna Marie Andrews, MS, OTR/L, BCG, MSW |

continued

Acute Care Back to the Basics: Burn Care

Julia Smith MS, OTR/L

continued

Learning Outcomes

- Identify the types of burn, burn depth and implications for wound healing, and functional recovery.
- Define different types of surgical burn interventions and purposes for each in the wound healing process.
- Describe the appropriate positioning, therapeutic exercise, scar and edema management intervention based on timing, location, and depth of burn.

continued

Skin Anatomy

continued

Functions of Skin:

Barrier for immune protection

Thermoregulation

Sensory feedback from environment

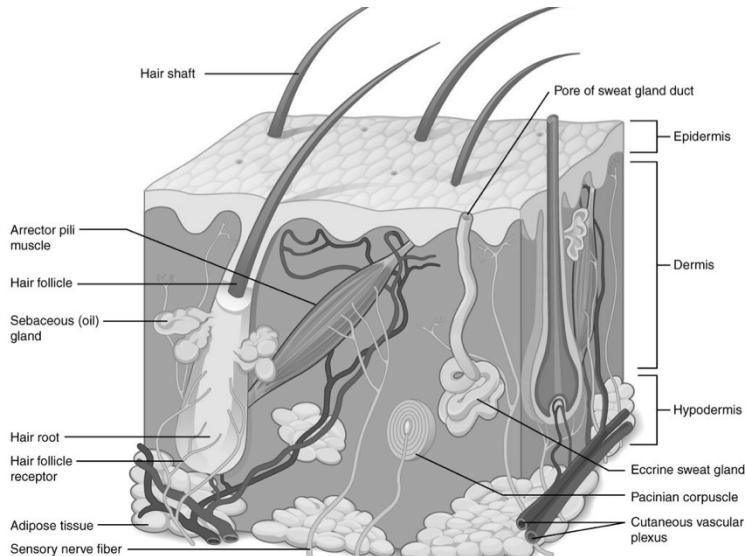
Prevent penetration from outside forces/objects

Vitamin D Production

Allows for motion and function

Resist mechanical stress

continued



continued

Layers of the Skin

▪ *Epidermis*

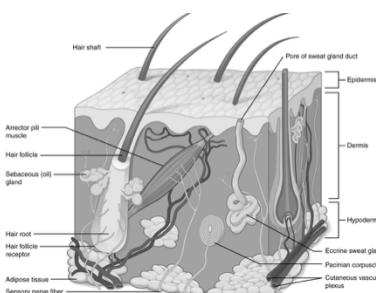
- Outermost layer
- Made of squamous cells

▪ *Dermis*

- Contains capillaries, hair follicles, and nerves

▪ **Subcutaneous tissue (aka hypodermis)**

- Contains fat, larger blood vessels, nerves
- Insulating layer



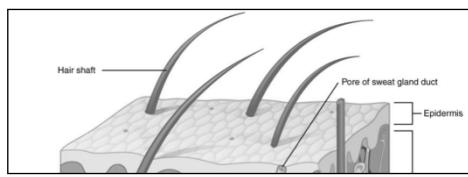
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Burn Depth

continued:

Superficial

- **Histological depth:** Epidermis
- **Characterization:** Painful, dry
- **Color:** Red, bright pink
- **Healing:** 3-7 days with peeling, does not scar
- NOT included in TBSA %



(*Q1)

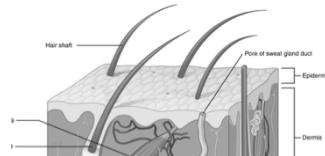


Ex. Sunburn

continued

Superficial Partial

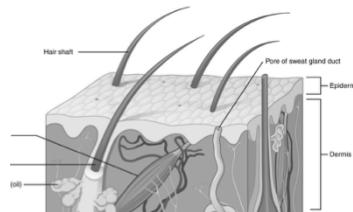
- **Layers affected:** Epidermis, papillary dermis
- **Characterization:** Painful, blistered, blanchable, moist/weeping
- **Color:** Bright red
- **Healing:** 7-21 days, re-epithelialization. Minimal to no scarring, may have pigment changes. Does not require surgical intervention



continued

Deep Partial

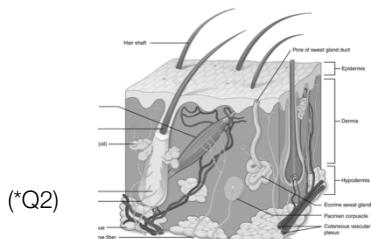
- **Layers affected:** Epidermis, papillae and reticular dermis
- **Characterization:** May not have pain, blanching indicates healing, pseudoeschar with protein buildup
- **Color:** Light pink to mottled white
- **Healing:** 21-35 days if no infection, may convert to full thickness. Can develop hypertrophic scarring



continued

Full Thickness

- **Layers affected:** Epidermis, dermis to subcutaneous tissue or deeper to bone
- **Characterization:** Waxy, dry, leathery, painless, hair falls out easily
- **Color:** Mixed white, waxy, pearly
- **Healing:** Requires skin grafting, often hypertrophic scarring



continued

Burn Types

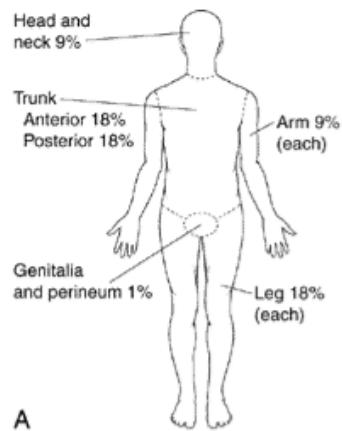
- Flame:** Often deep burns with clothing igniting
- Contact:** From touching hot surface, ex. motorcycle exhaust pipe to leg
- Scald or Grease:** Hot liquid
- Flash:** Fast source of energy, ex. flash while lighting a grill
- Electrical:** Current passes through body, often deep internal injury
- Radiation:** Most common is sunburn
- Chemical:** Strong acids or corrosive materials, often concrete
- Cold Burn (Frostbite):** Vasoconstriction causes ischemia, frequently requiring amputation
- Friction:** Road rash, sports injury, carpet, etc.

continued

Burn Classification and Terminology

continued

Total Burn Surface Area (TBSA)

Rule of 9s to calculate percentage**Increased TBSA Indicates= Increased risk for:**

Risk of medical complication and mortality



Risk for delirium



Incidence of contracture and scarring

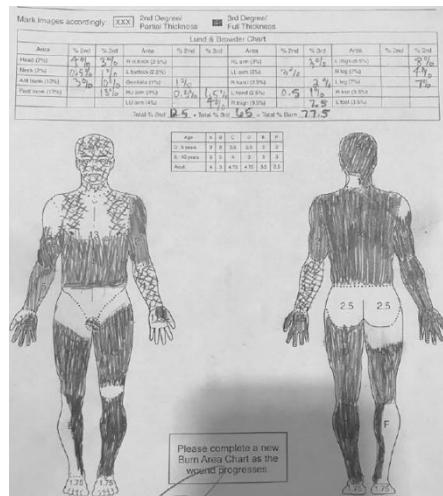


Length of stay

Lund-Browder Chart. (2013). Retrieved from https://commons.wikimedia.org/wiki/File:Lund-Browder_chart_burn_injury_area.PNG

continued

Lund and Browder



- Dictates fluid resuscitation protocol
- Location and depth of burn
- Calculation of TBSA %
- Completed for every admission
- Can change if wounds convert to deeper burns

continued

Cutaneous Functional Unit

- Area of skin recruited during movement to allow ROM
- More relevant indicator for contracture risk and therapy intervention
- Ex. Hand burns have small TBSA but higher risk for contracture vs. abdominal burn

(*Q3)

continued

Contracture

- Loss of ROM due to scarring and decreased elasticity of wound healing
- Described in the position they are contracted into
 - Ex. Neck flexion contracture for someone who can't reach extension
- Positioning and stretching are most important ways to prevent!
 - Primary role of the burn therapist is contracture prevention.
- Patients will often undergo long term surgical or laser intervention of contractures.

continued

Surgical Management of Burn

continued

Surgical Management of Burn

Escharotomies

- Emergent management of full thickness, circumferential burns
- Release through eschar (burnt tissue) to improve elasticity and prevent compartment syndrome
- Can also be done on abdomen for chest expansion
- **Activity:** No specific activity restrictions. High risk for contracture due to depth of these burns

**continued**

Surgical Management of Burn

Dehydrated human amnion/chorion membrane

- Treatment in partial thickness burns
- Provide extracellular matrix to promote healing and manage inflammation
- Minimal to no scarring
- No activity restrictions
- Sometimes used over donor sites to facilitate healing of new partial depth wound



continued

ReCell® Autologous Cell Harvesting Device

- Smaller donor site
- Often used for deep partial thickness burns
- Harvest skin broken down with enzyme solution and mechanical breakdown, put in buffer solution and sprayed on skin
- 80:1 ratio for coverage v. 2:1 of meshed graft
- **Activity:** Surgeon dependent, often ok for gentle activity

continued

Surgical Management of Burn

Integra™

- Bovine collagen and silicone layers which promote revascularization and cellular regrowth to develop healthy wound bed in preparation for grafting
- Frequently used over exposed tendons, full thickness burns, and less vascularized areas
- Activity: No specific precautions, though may be immobilized if tendons are exposed or pin placed in joints

(*Q4)



continued

Surgical Management of Burn

Xenograft

- Rarely used intervention
- Use of pig skin as coverage for large wound in preparation for autographing
- No activity restrictions

continued

Surgical Management of Burn

Allograft

- Cadaver skin
- Temporary coverage used to promote healthy wound bed in preparation for autograft
- Decreases infection risk, fluid loss, temperature regulation
- Often for large TBSA burns without enough available donor sites
- **Activity:** no activity precautions (unless specified by MD)



continued

Surgical Management of Burn Autograft

- Self-donation harvested from "donor site" on unburned area (often anterior thigh or abdomen)
- Final stage for wound healing
- **Sheet grafts**
 - Over cosmetic areas (face, hands)
- **Mesh grafts**
 - Mesh pattern (usually 4:1, for larger areas), grafts heal from outside in through interstices
- **Activity:** Initially immobilized if crossing joints for first 5 days until takedown of OR dressings
 - After 5 days, usually cleared for AROM POD 5/6
 - PROM initiated 7-10 days
 - Depends on surgeon preference and graft healing
 - Splinting may be used
 - High risk for contracture, scar banding, hypertrophic scar banding



(*Q5)

continued

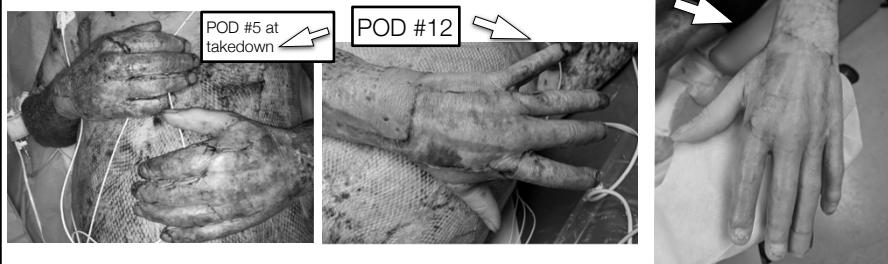
Autograft Healing

0-24 hours – grafts stick by weak fibrin bonds, adhered post sx. by staples and/or fibrin glue

24 – 48 hours: capillaries invade skin graft

4 – 5 days: collagen linkages are made between wound bed and the graft, Begin AROM

- MD clearance is necessary prior to any ROM along grafted area(s).
- NO SHEARING
- Minimize handling



continued

Donor Site Healing

- Creation of partial thickness wound to harvest skin for autografting
- Very painful
- Heal within 10-14 days, no ROM restrictions
- Little to no scarring, sometimes hyperpigmentation
- Most frequently anterior thigh, abdomen, though in large burns can be taken from any spared area (scalp, scrotum, etc.)



continued

Cultured Epithelial Autografts (CEAs)

- Utilized in high TBSA situations when donor sites are not readily available or enough to cover wound
- Cultures are sent to an outside lab/vendor where they are grown in "cassettes" and sent back to burn center where they can be applied to the patient
- Wide mesh autograft placed underneath CEAs
- Extremely fragile and susceptible to shearing



Activity:

- Immobilized for 7-10 days after placement
- Surgeon may order bedrest if on posterior legs, buttocks, or back
- After MD clearance for PROM, progress the same as autograft

continued

Amputation

- When the burn is extensive to the depth of bone or affecting vascular area
 - **Most often seen in cold injury/frostbite to digits of hands/toes**
- Infection may result in inability to salvage limbs
- Therapeutic intervention consistent with standard amputee care
 - Large focus on contracture prevention of remaining joints to maximize candidacy for prosthetic long term.
 - Involvement of orthopedic and physical medicine and rehabilitation team often indicated.

continued

Therapy Evaluation and Intervention

continued

Timeline of Intervention

Emergent phase
Admit - first 48 hours

Acute Phase
Wound closure
~1-3 days per % TBSA

Rehabilitative Phase
Scar Management
~1 year post injury

Timing of therapy intervention dependent on surgical timeline, medical co-morbidities, client-dependent.

continued

Emergency Phase (0-48 hours)

- **Evaluation of injury:** Cause? Where is burn? What is depth? What joints does it cross?
- ***POSITIONING***
 - reduce edema, contracture risk, peripheral nerve damage
- Comorbidities?
 - Trauma? Inhalation? Psych? Orthopedic?
- Prevent/reduce medical complications
 - Delirium prevention
 - Early mobility for cardiopulmonary
 - Pressure injury prevention
 - Monitoring and addressing Acute Stress Disorder
- Educate patient and family
 - Set expectations and timeline of therapy for duration
 - Fear about movement
- Begin ROM
 - A/AROM and engagement in functional tasks



continued

Acute Phase

- Continue with Emergent Phase interventions
- Edema reduction
- Splinting/positioning
- ROM
 - Pending phase of autograft healing will progress from immobilization > POD#5 AROM > PROM stretching
- Functional mobility and ADL engagement
- Therapeutic dressings
- Prioritize and emphasize area(s) in greatest need of treatment
- Many medical complications will arise during this phase
 - Renal failure
 - Sepsis
 - Delirium
 - Pneumonia
 - Infection
 - Hyper metabolism
 - Cardiac
 - ICU acquired myopathy

continued

Rehabilitative Phase

- Home Stretching Program
 - Self-PROM, caregiver training
- Scar Management
 - Maturation occurs for ~ 1 year post injury
 - Scar Massage
 - Custom Compression Garments
- Desensitization
- Community reintegration
 - Return to work, leisure activity
- Psychosocial/cognitive- Burn Specific Health Scale, PTSD Scale

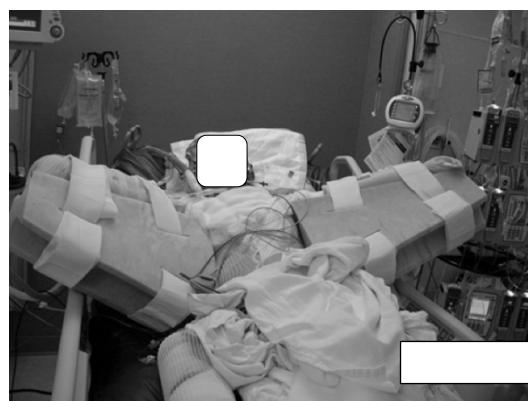
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Positioning

continued:

Positioning

POSITION OF COMFORT = POSITION OF CONTRACTURE



continued

Neck Burns

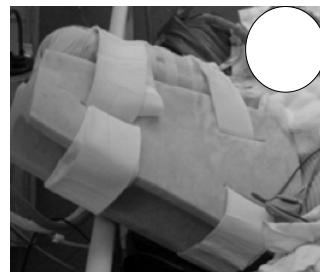
- Promote neck extension
- Prevent preference for unilateral cervical flexion
- No pillows! (Sand pillows are ok)
- Custom thermoplastic or silicone lined splints or Watusi collars post-op



continued

Axillary Burns

- Promote Abduction
- Prevent Internal Rotation
- Hip abduction wedges
- SCOI bracing
- 3+ pillows



continued

Elbows

- Promote extension
- Elbow restraints/
Freedom splints
- Anterior slab thermoplast
splints



continued

Knees

- Promote extension
- Foot of bed locked
out
- No pillows under
knees
- Knee immobilizer at
rest if contracting
- Encourage
mobilization when
able

Ankles

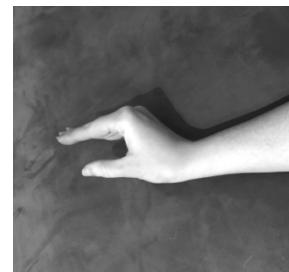
- Promote dorsiflexion
- Rooke boots
- Posterior slab splints

continued**Hand/Wrist**

- Intrinsic plus positioning
 - Wrist extension, MCP flexion, PIP and DIP extension
- For small burns:
 - Customize splint to immobilize only necessary joints and allow AROM of unaffected joint



(*Q6)

**continued****Splint? When and How Long?****No splinting**

- Partial thickness burns
- Full thickness burns prior to autografting with patient participating in AROM/functional use during day

At all times

- Post-autografting until POD #5 (or cleared for activity by MD)
- Patients with exposed tendons
- Intubated and sedated patients who are not able to complete AROM

Nighttime Splinting

- If decreased ROM noted in deep partial burns or prior to autografting
- Post autografting for ~1-2 weeks if decreased ROM
- Delirious or confused patients for graft protection

(*Q7)

continued

Edema Management in Emergent/Acute Phase

- Elevation positioning (2+ pillows)
- AROM when able
 - Squeezing sponge
- Therapeutic wound dressings
- ACE figure 8 wrapping
- Once healed or close to healed:
 - Coban wrapping
 - Edema glove placement
 - Massage



(Q8)

continued

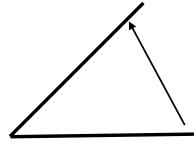
Desensitization

- Hypersensitivity can be barrier to engagement in ADLs
- Once healed, patients educated to expose scars to different textures, temperatures, and touch
- When patient take off gloves or compression during exercise, encourage exposure to different sensations
 - Ex. dry washcloth vs. smooth pillow case
 - Touching a cup of ice progressing to holding ice cube
- Graded exposure to improve engagement in environment



continued

Goniometry



- Complete after stretching
- Can measure under anesthesia to get maximize PROM and determine if true contracture, heterotrophic ossification occurring vs. pain limitations and guarding during stretching
- Distance from finger tip to distal palmar crease is fast glance way to monitor full composite fist ROM in between goniometer measurements
- Frequency? Client dependent, every 1-2 weeks pending progress or decline

continued

Therapeutic Exercise

- AROM
 - Other than during periods of immobilization, encourage functional ROM and use at all times
 - Can begin IMMEDIATELY after injury until surgical intervention occurs
 - Can begin immediately after allograft
 - Can begin ~POD 5 after auto graft
- AAROM – This is the best!
 - Achieve maximal AROM followed by stretch to full end range
- PROM - "Stretching"
 - Low load, prolonged stretch
 - 2 min hold/joint supported by current evidence
 - Encourage hourly
 - Moisturize skin before and after
 - Characterized by blanching at affected joint

(*Q9)



continued

Strategies for Increased Stretching Compliance

- Premedication prior to therapy sessions
 - During early phases, can complete in wound care or OR (with physician approval)
- Total body v isolated joint stretching
- Family/caregiver presence
- Customize home exercise program
- “Hands off” stretching
- Gradual stretching:
 - No “cranking”
- Use objective goals
 - Time, measurement, blanching to mark successful stretching
 - “Homework” on white board
- Virtual reality
- Set realistic goals per patient’s tolerance

(*Q10)

continued

Home Exercise Programs

- Customize client-centered program based on specific injury, realistic frequency and duration based on patient’s engagement and tolerance
 - Take picture of patient completing own stretches
 - Utilize layman language
 - ‘Prayer hand’ v ‘wrist extension’
 - ‘Snow angels’ v ‘shoulder abduction’
- “Stretching is your full time job”!**

continued

Spine

- Cat/Cow: Gentle arch and round through your upper back



Weight bearing into wrist extension

Back/Trunk Stretching
Knee Flexion

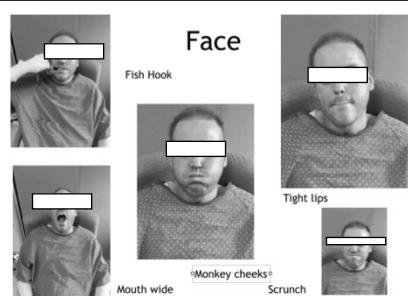
Wrist Extension

- Place both hands together and apply pressure. Do this with a bent elbow.
- Try to push heels of hands down and elbows out
- Hold for 2 min



Weight bearing into wrist extension
Elbow extension

Face



continued

Trunk Rotation + Chest Stretch



- With both arms to the side, bend both knees up and let them fall to one side. You should feel a stretch down your side.
- Hold for 2-3 min.
- Repeat on the other side.
- Add a towel roll along your spine to stretch your chest.



- Use light weights in gravity dependent position for additional stretching
- Be cautious with overhead shoulder stretch with weights
- Use ACE wrap to hold low load prolonged stretching and leave for 2-5 minutes
- Some tolerate better than hands on stretching

continued

Functional Tasks!

- ADL tasks
 - Opening containers
 - Grooming tasks
 - Dressing
- Group Activities
- Board Games
- Playing Cards
- Handwriting Activities
- Coloring Books
- Wii/Video games
- Smartphone use
- Compensatory strategies

**continued**

Scar Management

continued

Types of Scars



- **Hypertrophic Scarring**
 - Raised scarring within borders of wound
 - Most common burn scarring
 - Often thick, not pliable
- **Keloid Scarring**
 - Raised scarring, extends beyond perimeter of wound
- **Scar Banding**
 - Crosses joints
 - Often needs long term surgical intervention to correct

**continued**

continued

Compression

- **Purpose:** soften scars, improve soft tissue mobility, prevention and mitigation of hypertrophic scarring
- 25 mmHg is evidence based standard for level of compression for 23 hours per day
 - Achieved through outpatient custom measured garments
- During acute phase, as patient heals and dressings are reduced, place in edema glove and put tensoflex on limbs.
- Silicone lined splints can be made for cosmetic areas, face masks, face, or areas with scar banding to further soften these areas where garments are hard to customize..

continued

Scar Massage

Why?

- Prevent adhesions
- Softening and improve pliability
- Desensitization
- Flattening of hypertrophic scars

How?

- Moisture with lotion first
- Horizontal, vertical, and circular massage
- Deep pressure to tolerance or blanching

continued

Psychosocial Impact

continued

Premorbid:

- 50% of patient had a psychiatric disorder in the year before injury
- 33% have an ongoing psychiatric disorder at the time of injury
- **55.6% of burns drug and alcohol related**
- Direct Injury (self-immolation)
- Indirect Injury (impulse control, poor judgement, decreased vigilance)

Post injury

- ASD/PTSD
- Delirium
- Depression/Anxiety
- Pain Management
- Sleep Disorders
- Substance Abuse
- Change in functional status
- Social Isolation/Image adjustment after scarring

continued

Therapeutic Intervention

- Use of mirror to help patient look at scarring
- “Burn Book” of pictures for progression graft healing to anticipate
- Visit from burn survivor
- Mindfulness strategies
- Pain and anxiety coping strategies

continued

Long Term Complications

- Contracture
- Heterotrophic Ossification
- Neuropathy
- Itch
- Scarring
- Infection
- Nerve Injury
- Dialysis
- Chronic Pain
- Addiction

Recovery is just beginning for
burn survivors at their discharge
from the hospital!
Close outpatient follow-up is
essential to success of these
complex patients.

continued

Therapist and Patient Resources

American Burn Association

<http://ameriburn.org/>

Phoenix Society

<https://www.phoenix-society.org/>

"All I wanted to do was leave the hospital, but once I did all I wanted was to have those layers of support back" -Patient

continued

Questions??

continued

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continued

Acute Care Back to the Basics Virtual Conference

Mon 2/17 Acute Care Back to the Basics: Vision Assessment and Management
Leah Muntges, MOTR/L

Tues 2/18 Acute Care Back to the Basics: OT's Role in Critical Care
Lyndsay Laxton, OTR/L
Meghan Morrow, OTR/L

Wed 2/19 Acute Care Back to the Basics: Burn Care
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Fri 2/21 Acute Care Back to the Basics: Gerontology
Marianna Marie Andrews, MS, OTR/L, BCG, MSW