

# **From Trauma to Triumph: Rehabilitation Pathway for Burn Survivors**

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# Burn Overview

Burns are damage to skin and tissue caused by heat, chemicals, electricity, radiation or sunlight

Degree of severity determined by size and depth of burn

# Burn Types

First Degree – damage only to the outer layer of epidermis

Second Degree – Epidermis and layer underneath referred to as the Dermis

Third Degree – Epidermis, Dermis and damage extending into the subcutaneous tissue

# Question

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**What is the most common type of burn injury in the US?**

1. Chemical
2. Thermal
3. Radiation
4. Electrical



# THERMAL

Skin and tissue injuries caused by excessive heat

- Hot surfaces
- Liquids
- Steam
- Open Flames



# Treatment Overview:

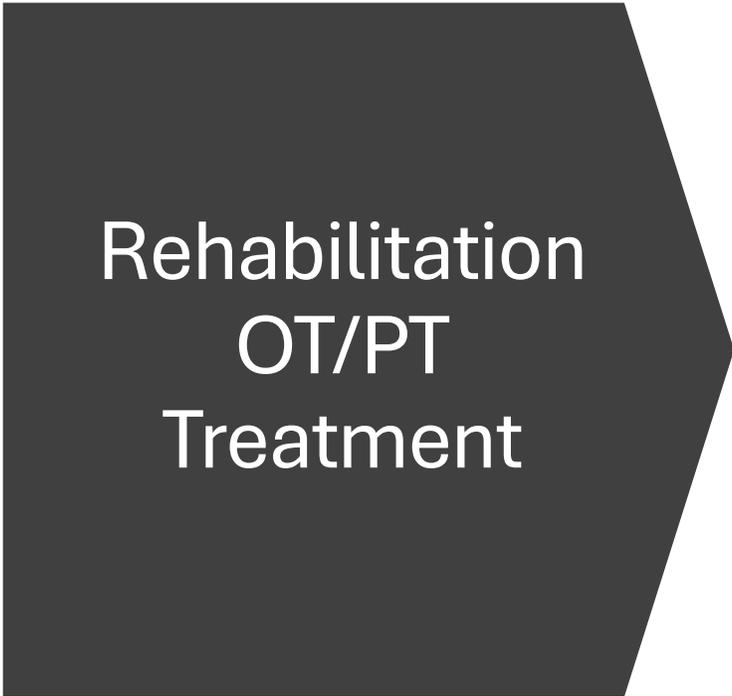
Burn Debridement

Oral or IV antibiotics  
to reduce infection

Compression  
Garments

Grafting

Therapy and  
aggressive treatment  
for pain management



Rehabilitation  
OT/PT  
Treatment

Early Rehabilitation important

Evaluation/ Chart Review

Burn depth and location

Respiratory & cardiac status

Mental status

Goals Set

Treatment / Approach

Complications

Special Considerations / needs

Preparation for discharge / ADLs and mobility

# OT/PT Therapies

Early & continued attention to positioning of burn areas

Management & prevention of joint/soft tissue contractures & deconditioning

Improving independence with functional mobility

Treatment duration 1-2 years after injury

Scarring will continue making therapies and ROM critical

# Extremities Positioning

- Strength if participatory
- Vary positioning
- Edema control
- Positioning & Splinting needs
- Skin integrity (necrosis, exposed tendons, etc.)
- Nerve damage can result from prolonged pressure
  - Minimize pressure to soft tissue (air beds or turning schedules)
- Assessment and Goals

# Range of Motion (ROM) – with MD orders

## To ALL joints 2-3 x daily

- PROM (passive range of motion)
- AAROM (active assisted range of motion)
- AROM (active range of motion)

## Hold ROM

- 5-7 days after grafting new areas
- Longer for cultured autografts (CEAs) which are more fragile
- Continue ROM to other joints
- Range neck, face & torso if possible

- Isolated/Protected ROM only for hands with:
  - ✓ Electrical burns
  - ✓ Deep burns
  - ✓ Possible tendon damage

# Pain

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Tremendous pain

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Oral morphine equivalents inversely related to delirium

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Methadone gaining acceptance for baseline pain

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Methadone typically weaned before going to rehab

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Ketamine protocol in place for critical care

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Gabapentin may have benefit

# Psychologic Concerns

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Depression

PTSD

Role changes

Consideration  
of other  
losses

Community  
reintegration

# Question

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What is the #1 complication of severe burn injuries?

1. Infection
2. Pulmonary
3. Cardiovascular
4. Neuropathy



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# INFECTION



# Infections

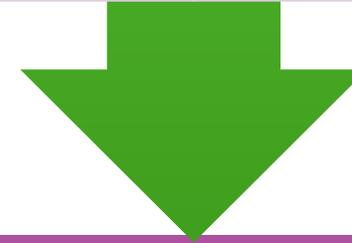
51% of Burn Deaths are due to infection

Pneumonia

Cellulitis

UTI

Burn site  
infections

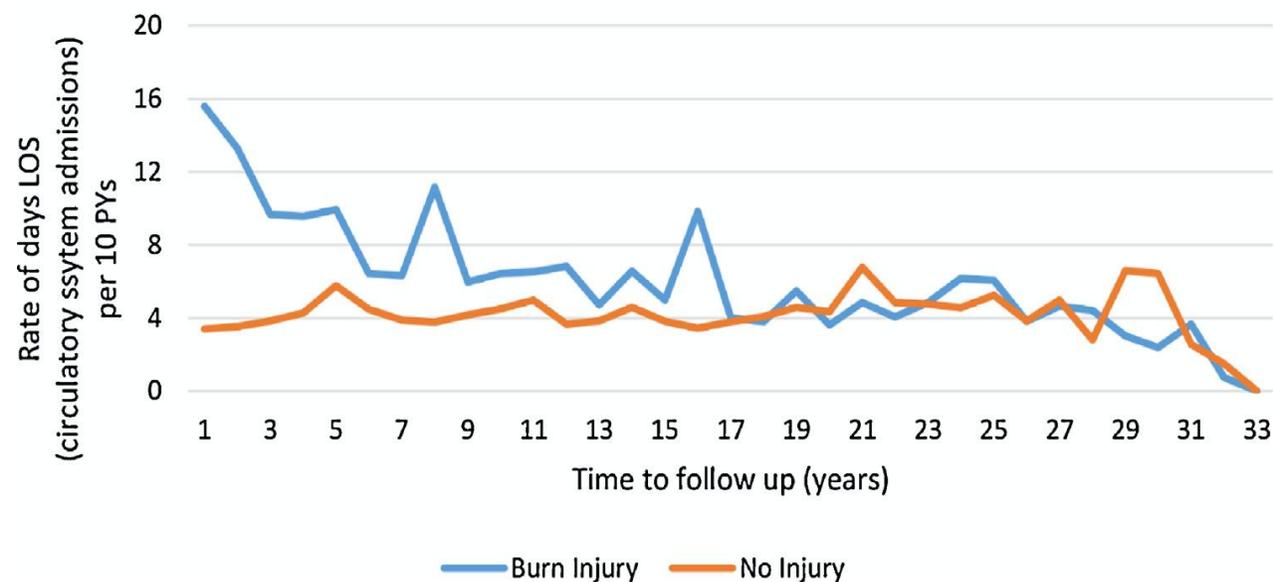
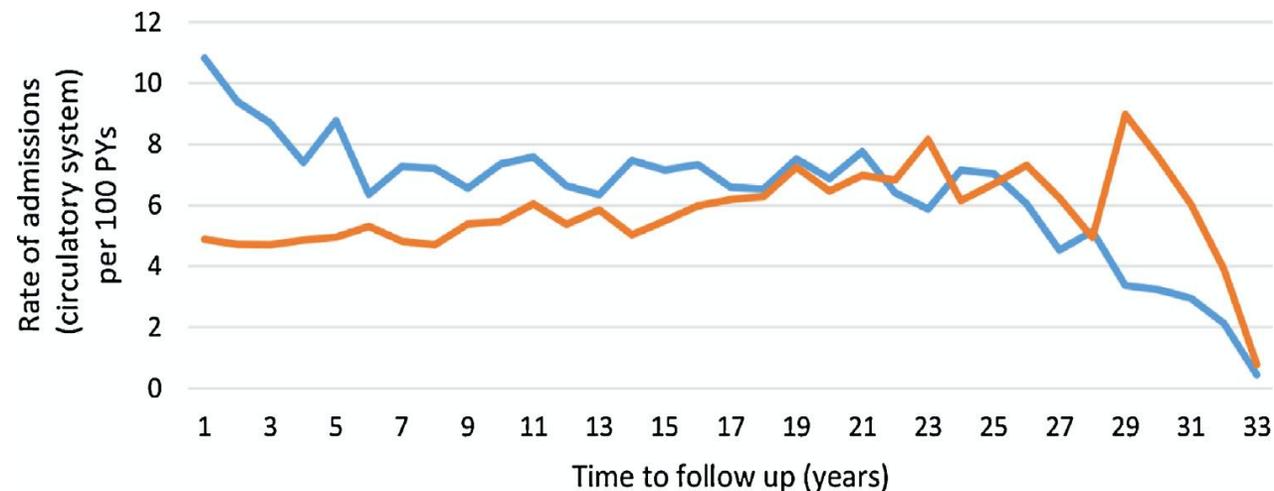


Burn Survivors are 1.75 times more likely  
to die from infections chronically

Worst danger in the first 5 years post burn

# Chronic Cardiac Dysfunction

- Increased risk of cardiac hospitalization and longer LOS post-burn
- Oxygen consumption and heart rate go up
- Inflammatory cytokines may drive cell death and dysfunction in the heart



# Pulmonary Considerations

Vocal cord dysfunction may be seen due to prolonged / traumatic intubation

Tracheomalacia and long-term trach usage

Thoracic scars can create restrictive lung disease

Inhalation lung injury can cause chronic diffusion deficits

# Neuropathy

Symptoms common to burns might include shooting, stabbing, sharp or burning pains & tingling, numbness and increased sensitivity to touch.

30% burn patients have neuropathy

Compression on nerve most common cause

Age, male gender, TBSA and electrical burns have higher probability for neuropathy

Acetylcholine receptors (protein found on surface of cells) are upregulated near burns. The number and density of receptors on surface of cell increases following thermal injury.

# Heterotopic Ossification (HO)

What is HO? Condition where new bone tissue forms in soft tissues, muscles, tendons and ligaments. Abnormal bone growth can lead to pain, stiffness and reduced ROM.

>20% total body surface area (TBSA), intubation, male gender and electrical burns are risk factor for HO

Acute Kidney Injury (AKI), intubation and multiple organ failure complicate diagnosis and treatment common for HO



What is the joint most commonly affected by HO?

1. Knee
2. Elbow
3. Wrist
4. Hip

ELBOW





# Lymphedema

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- Swelling of tissues caused by lymphatic system's inability to drain fluid properly follow burn damage to lymph vessels
- 25 mmHg compression required to control volume
- Compression garments must be worn 23+ hours per day

# Compression

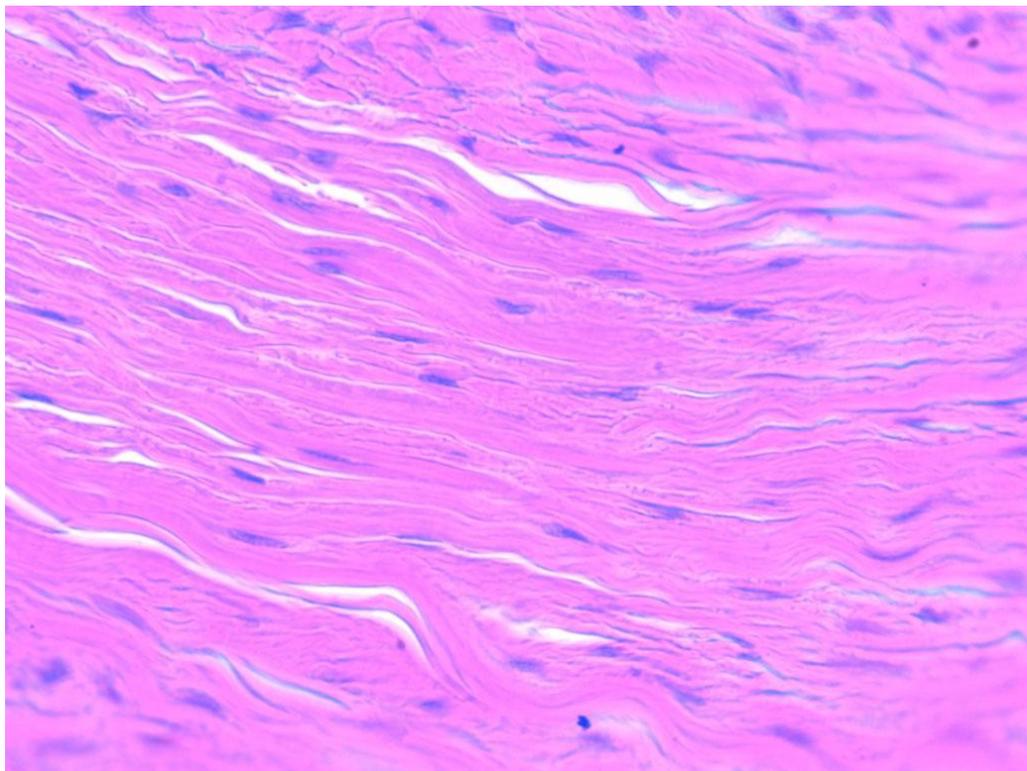
- Early
  - Isotoner gloves
  - Co-wrap
  - Tubigrip
  - Cage to apply
- Custom Garments
- Silicone gel, Neoprene
- Elastomer inserts
- Children-
  - Highly prone to scarring
  - Longer garment wear
  - Low tolerance to silicone gel



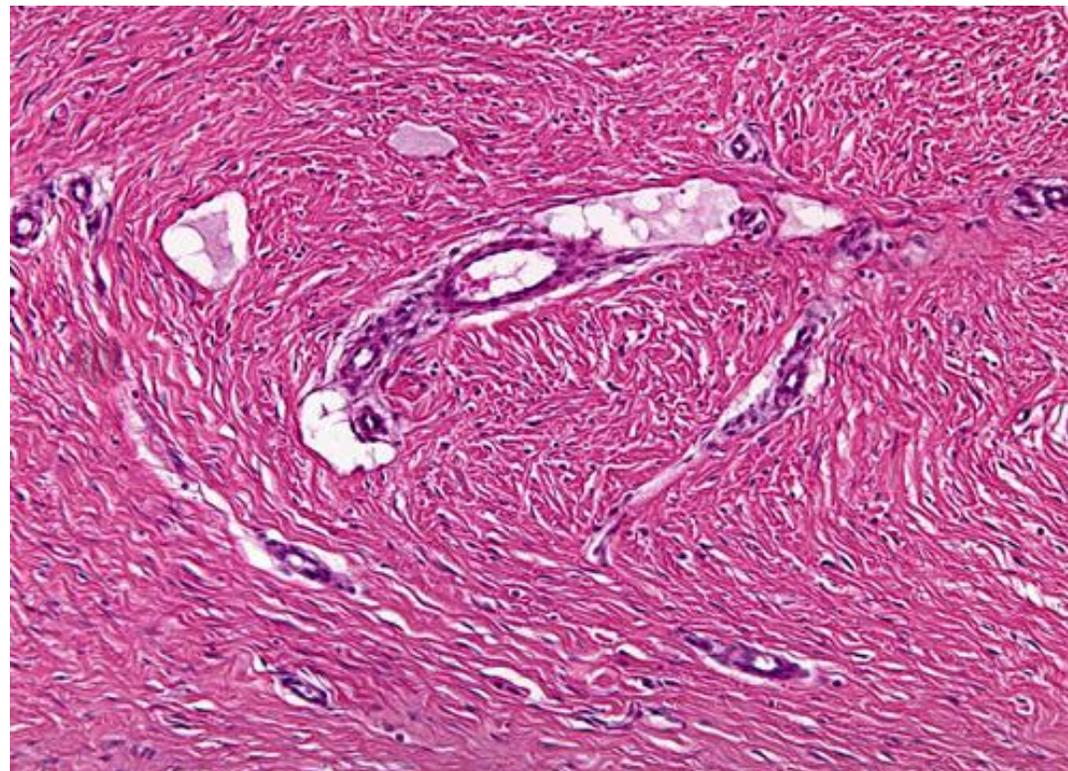
# Hypertrophic Scarring

- An excessive wound healing response causing raised, thick and often discolored scars often darker in pigmentation
- Dynamic process that is metabolically active for at least 18 months
- Caused by prolonged inflammatory wound phase and exaggerated response of fibroblasts to healing
- Characterized by 3 Rs
  - ❖ RED – hypervascular
  - ❖ RAISED – 4x as much collagen in burn wound
  - ❖ RIGID – collagen is disorganized with decreased pliability

Normal Collagen



Hypertrophic Scar



# Hypertrophic Scarring

## Pressure Garments

- Need 25 mm of pressure to counteract the contraction of the scar
- 23 hours per day up to 18 months post burn

## Scar Release

## Fractional Ablation Laser Therapy

# Long Term Dermatologic Complications

## Temperature Regulation

- Loss of sweat glands

## Skin Protection

- More friable skin
- Increase risk sunburn
- Dry skin

## Skin Integrity

- Loss of oil glands
- Daily lotion/ointment necessary
- Decreased Vitamin D production

# Outpatient Therapy

- Continue
  - ✓ ROM
  - ✓ Strengthening
  - ✓ Scar management
  - ✓ Coordination
  - ✓ Mobility
  - ✓ Edema Management
- Monitor / Upgrade Home Exercise Program
- Ask about Function
- Return to work/school/leisure
- Work Hardening?
- Vocational Rehab?
- Burn Support Group
- Phoenix Society
- Burn Camp
- Counseling needed?
- Ability to drive vehicle?

# Case Study - History

- 28 yr old male commercial roofer
- DOI 11/30/23 using flame torch to heat roof while co-worker behind him spreading flammable roofing material. Someone called out and worker turned with torch still lit and came in contact with combustible material causing explosion.
- Severe Burns & Air Lifted to burn center



# Case Study - Treatment

Diagnosis – 3<sup>rd</sup> degree burns to 28% body including neck, chest, abdomen, back, hands and upper thighs



## Treatment-

- Extracorporeal Membrane Oxygenation (ECMO) x 1 month
- IV antibiotics
- Debridement of burns
- Skin grafts multiple area
- Compression garments
- Discharged to Rehab Center 2 months post injury

# Case Study – Rehab Center

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- Inpatient Rehab Center – specific center not familiar with WC
  - ✓ Discharged after 2 weeks
  - ✓ No coordination follow up care
  - ✓ No plan for outpatient therapy
  - ✓ No plan to evaluate mental health status
  - ✓ No mention of non-compliance with compression garments

# Case Manager assigned

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Identified barriers for success and facilitated outpatient appointments back at burn center



Facilitated provider discussion regarding

Respiration and Speech

Hands and concern re compression usage

Mental Health concerns

# Case Study Results with Case Manager:

Physical Medicine & Rehab (PM&R) identified as gatekeeper for medical care moving forward

Referral to Pulmonary

Referral to Psychiatry

- medication & counseling

Referral to OT Hand therapy, PT & eventually work hardening

- identified resources in home area

Identification of appropriate compression garments – fingerless gloves

Follow up Burn Center visits

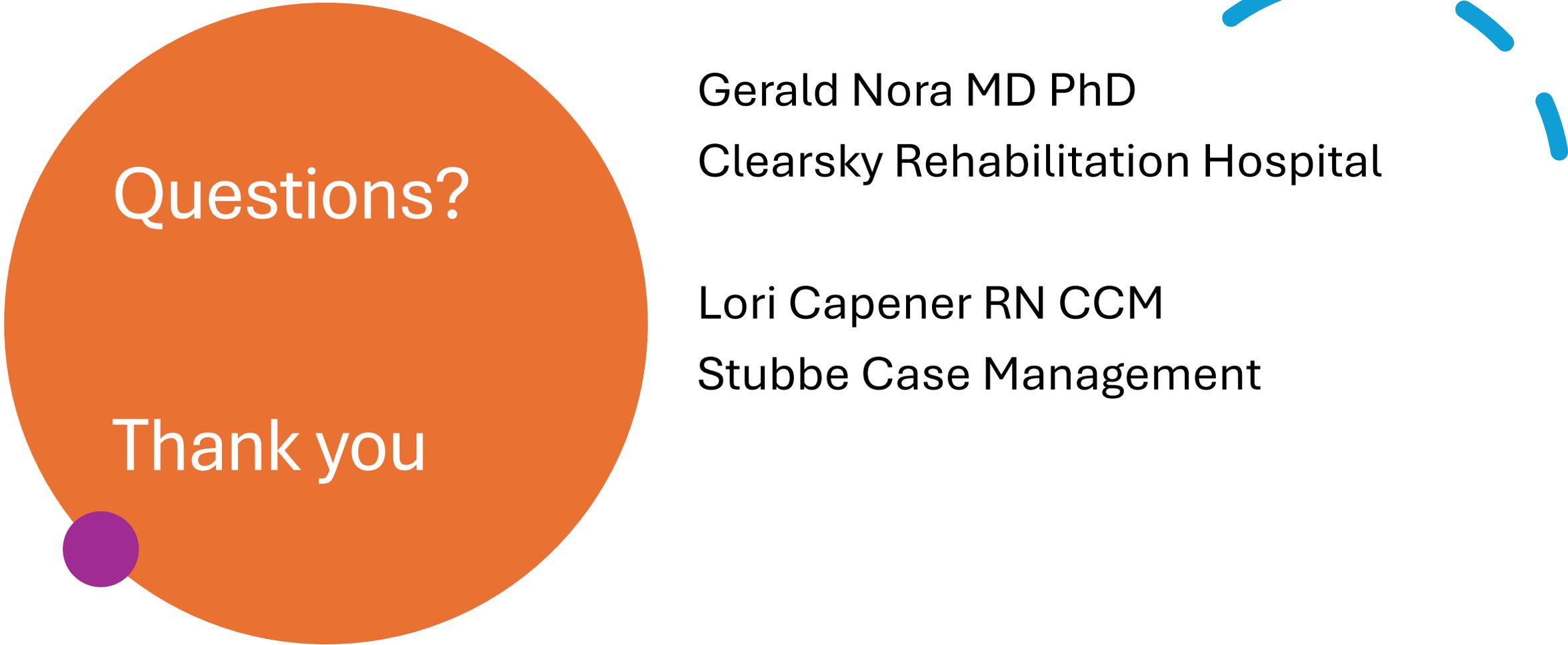
# Case Study- Ongoing Outcome

Burns to hands resulted in amputation right pinky finger 1 year and 9 months post injury

Difficulty healing post amputation due to abnormal skin with slow improvement

Functional capacity evaluation (FCE) to be completed once amputation healed which will help determine appropriate PPD and permanent restrictions

Worker returned modified duty with same employer



Questions?

Thank you

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