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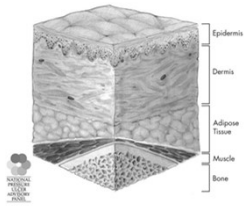
Wheelchair Positioning: Pressure

Michelle L. Lange, OTR/L, ABDA, ATP/SMS



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Learning Outcomes

The participant will be able to:

1. Define and describe stages of pressure injury
2. Describe primary strategies to address pressure in wheelchair seating
3. Identify client parameters to appropriate seating technologies

2

What we will be covering:

- Pressure Injuries
  - Definitions
  - Etiology
  - Staging
- Strategies to prevent pressure injuries in wheelchair seating
- Matching client parameters to product
- Case Study

3

Pressure Injury Definition

- National Pressure Ulcer Advisory Panel (NPUAP)
- International NPUAP-EPUAP Pressure Ulcer Definition

"A pressure injury is localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue."

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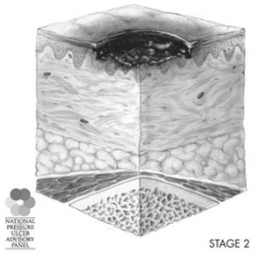
Pressure Injuries

- 450,000+ pressure related wounds reportedly annual among wheelchair users and hospitalized patients
- $37,800 average cost of hospitalization due to pressure related wounds



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Other Definitions

- Ischemia – Impaired blood supply to tissue
- Tissue deformation – a change in shape of tissue from one condition to another
- Hypoxic - a condition where tissue cells are deprived of an adequate supply of oxygen
- Tissue necrosis – premature death of tissue cells
- Normoxic – a condition where tissue cells have adequate oxygen supply for life sustaining function
- Apoptotic cell death- normal process programmed cell death in tissue
- Perfusion / reperfusion – the flow of blood through the circulatory system (perfusion) and the restarting of flow after a period of no flow (reperfusion)

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So what causes a pressure injury to develop?

Pressure Injury Causes

7

Pathways to Tissue Damage

- Ischemic Pathway
  - Soft tissue compressed and deformed between bony prominences and support surfaces
  - Up to six hours to cause cellular damage
- Deformation Pathway
  - Cell damage can occur in minutes to hours

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Pressure

- Contributing Factors
  - Heat
  - Moisture
  - Poor pressure distribution
  - Lack of sensation
  - Incontinence
  - Poor hygiene
  - Poor nutrition
  - Prior pressure injuries
  - Immobility
  - Friction
  - Shear
  - Inactivity
  - Decreased mental status

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Pressure Injury Staging

- Pressure injuries are staged or categorized, often by a wound care specialist
- Stage of the wound determines treatment

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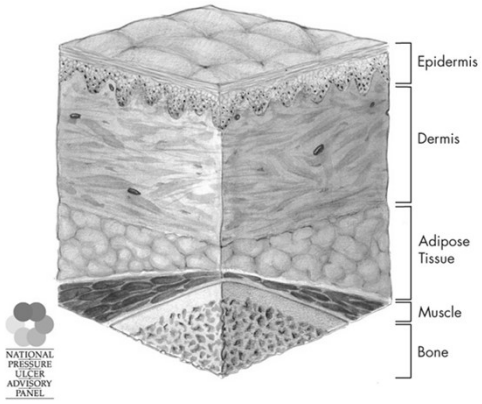
Pressure Injury Staging

- Normal skin



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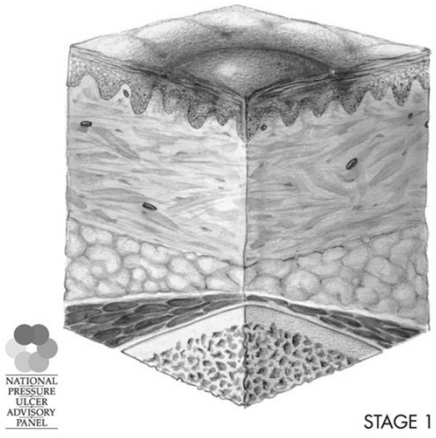
Pressure Injury Staging

- Category/Stage 1
  - Intact skin
  - Non-blanchable (when you press on the redness, it stays red instead of blanching white and returning to red) erythema (redness)
  - Usually over bony prominence
  - May be soft, warmer or cooler than adjacent tissue
  - Difficult to detect in individuals with dark skin tones



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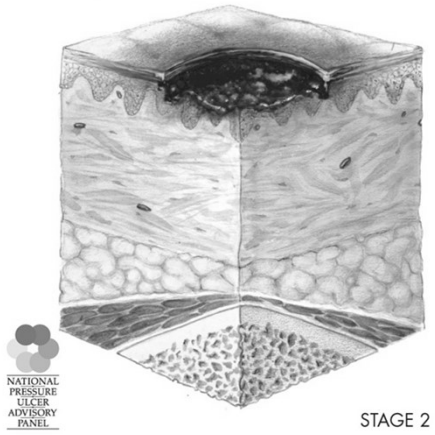
Pressure Injury Staging

- Category/Stage 2
  - Partial thickness loss of dermis
  - Shallow open ulcer with red pink wound bed, without slough
    - Slough: dead tissue separating from living tissue
  - Intact or open/ruptured serum-filled or sero-sanginous filled blister
    - Serum/serous fluid: clear yellowish fluid remaining from blood plasma after clot formation
    - Sero-sanginous/serosanguineous: containing both blood and serous fluid



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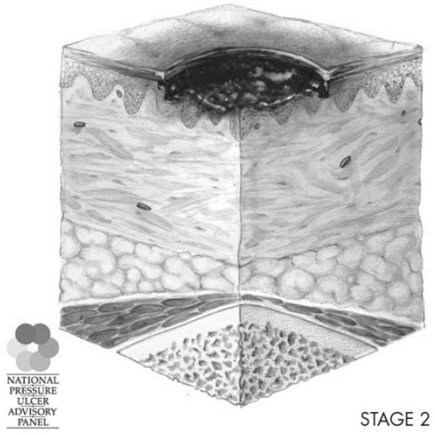
Pressure Injury Staging

- Category/Stage 2
  - Partial thickness loss of dermis
  - Shiny or dry shallow ulcer, no bruising
    - bruising indicates deep tissue injury
  - Does not apply to skin tears, tape burns, dermatitis from incontinence, maceration or excoriation
    - Dermatitis: skin inflammation
    - Maceration: softening of tissues by soaking
    - Excoriation: skin abrasion



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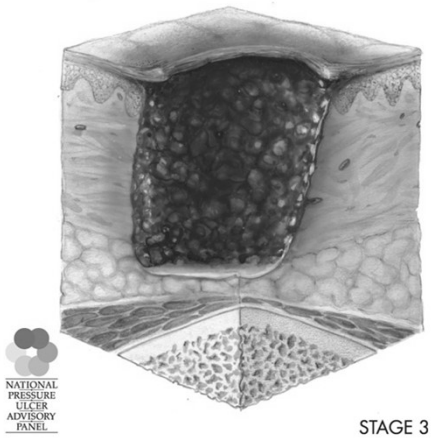
Pressure Injury Staging

- Category/Stage 3
  - Full thickness skin loss
  - Subcutaneous fat may be visible, but not bone, tendon or muscle
  - Slough may be present, does not obscure the depth of tissue loss
  - May include undermining and tunneling
    - Undermining: base of the wound is larger than the opening
    - Tunneling: portion of the wound that moves away from the main opening, usually one direction



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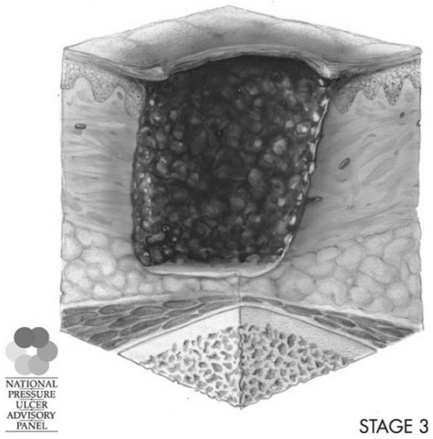
Pressure Injury Staging

- Category/Stage 3
  - Full thickness skin loss
  - Depth various by anatomical location
    - i.e. No subcutaneous tissue over malleolus (medial bump at ankle)
    - Can be very shallow or quite deep



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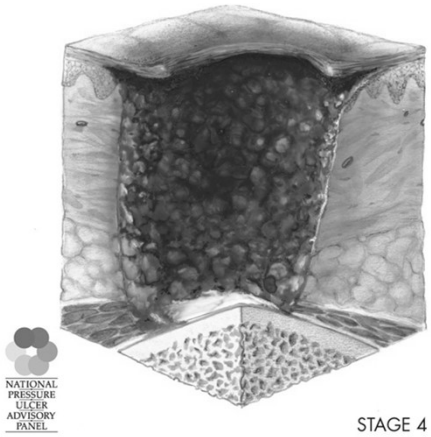
Pressure Injury Staging

- Category/Stage 4
  - Full thickness tissue loss with exposed bone, tendon or muscle
  - Slough or eschar may be present
    - Eschar: dead tissue that falls off healthy skin
  - Often includes undermining and tunneling



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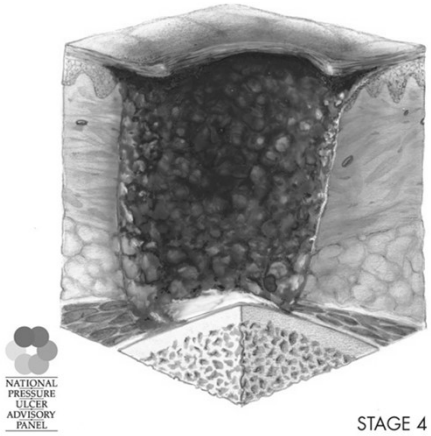
Pressure Injury Staging

- Category/Stage 4
  - Full thickness tissue loss
  - May be shallow or quite deep
  - Can lead to osteomyelitis or osteitis (bone infection or inflammation)
  - Bone/muscle is visible or directly palpable



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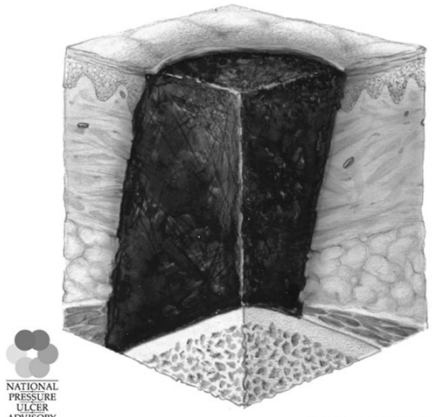
Pressure Injury Staging

- Unstageable/Unclassified
- Used in USA only
- Full thickness skin or tissue loss, depth unknown
- Depth is obscured by slough (yellow, green or brown) and/or eschar (tan, brown or black) in the wound bed
- If the slough or eschar are removed and depth is determined, then stage 3 or 4



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Pressure Injury Staging

- Unstageable
- Stable eschar (dry, intact) on the heels should not be removed
  - Natural cover

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Pressure Injury Staging

- Suspected Deep Tissue Injury
- Depth unknown
- Used in USA only
- Purple or maroon localized area or discolored intact skin or blood-filled blister due to damage of underlying soft tissue
  - from pressure and/or shear
- May progress to:
  - thin blister over dark wound bed
  - covered by thin eschar
  - Exposure of additional layers of tissue

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Questions?

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Case Study

- 45 year old woman
- Multiple Sclerosis
- Pressure relieving cushion, power tilt in power wheelchair
- Still ended up with a pressure injury
- Evaluation recommended for new cushion
- Recommendation: adapted phone!

Jay cushion

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Case Study

- Caregiver did not show
- Woman spent 24 hours in wet and soiled clothes in wheelchair
- Cushion was fine, weight shifts were available
- Still needed to be transferred, clean and dry!
- Next time, she will be able to call!

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Treatment

- Treatment has improved tremendously over the years and includes:
  - Medications
  - Debridement, dressings
  - Wound vacs
  - Surgeries
- Prevention is easier!

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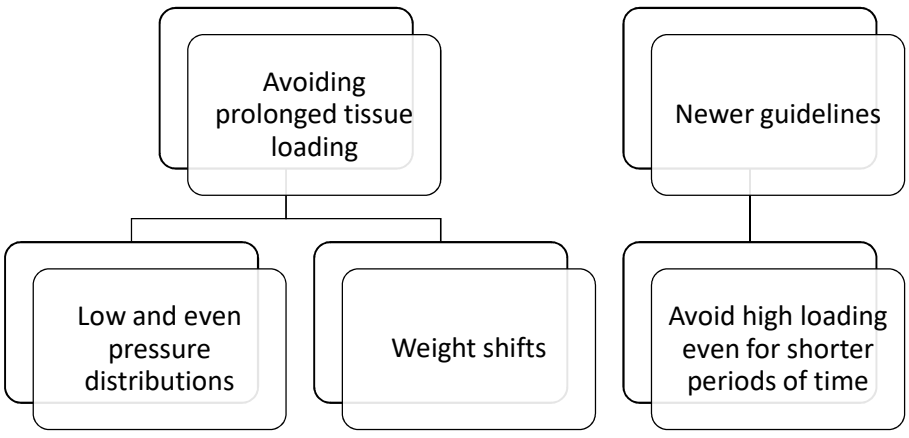
General Strategies



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Seating Implications

- Pressure distribution
- Pressure relief
- Reducing other causative factors
  - Heat
  - Moisture

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Pressure Distribution

- Distribute pressure over as large an area as possible
  - Peak pressures at or below 80 mm Hg
  - Materials that provide immersion
  - Contoured
  - Molded
- Increased immersion may interfere with transfers
- Some of these materials are less stable and so do not provide as much postural control

Ride Designs

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Pressure relief

- Provide complete relief to specific areas for specific lengths of time
  - Tilt and/or recline
  - Alternating air cushions
  - Cushions that unweight key areas
  - Weight shifts
    - Forward lean
    - Push-ups
    - Lateral lean
    - Wheelie

Ki Mobility Focus

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Tilt Guidelines

- Consortium of Spinal Cord Medicine – PVA
- Tilt every 15-30 minutes
- Remain tilted at least 1 minute
- Tilt more than 30 degrees to provide pressure relief
- Optimal pressure relief:
  - 25-35 degrees tilt in combination with 120 degrees recline

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Heat and Moisture

- Consider seating and upholstery materials that reduce both heat and moisture

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Comparison of Materials

- Foam
- Viscoelastic foam
- Solid gel
- Viscous fluid
- Air

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Density: weight of the cushion by volume (lbs/cubic foot)

Stiffness: how deep a person will sink into the cushion

Resilience: ability to recover shape

Definitions

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Damping: ability to soften impacts

Envelopment: ability to surround pelvis

Shear: forces that occur when surfaces slide across one another

Thermal: how well cushion transfers heat and cold

Definitions

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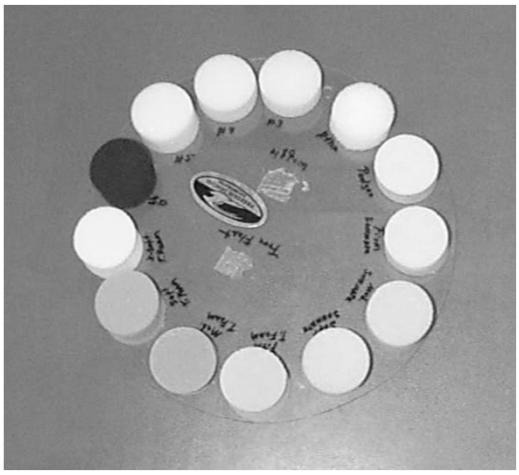
Foam

- Examples:
  - Polyurethane
  - Latex



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Foam

Pros:	Cons:
Inexpensive	Breaks down quickly
Resilience	Shear
Lightweight	Retains heat
	Damaged by light/moisture

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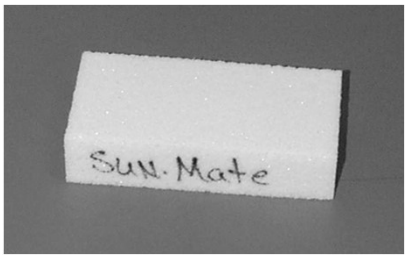
Viscoelastic Foam

- Examples:
  - Pudgy
  - Sunmate
  - Temperpedic or T foams



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Pros:

Good Envelopment

T foams dampen vibration well

- Developed for pilots

T foams are temperature sensitive

Cons:

Fair resilience

Poor damping

High shear

Retains heat

Pudgy can freeze

Some are heavy

Can be damaged by light and moisture

Viscoelastic Foam

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Solid Gel

- Examples:
  - Action

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Solid Gel

Pros:

Low to medium shear

Good for padding components when pressure is an issue

Good thermal properties

Cons:

Heavy

- Can affect self propulsion

Poor resilience, damping and envelopment

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Viscous Fluid

- Examples:
  - Jay

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Pros:

Poor resilience and damping

Low shear

Good thermal

Cons:

Good envelopment, dependent on container

Can freeze

Can puncture

Can change over time

Viscous Fluid

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Air

- Examples:
  - Roho
  - Star

Roho

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Air

Pros:

Performance is based on container
Good resilience and damping
Typically good envelopment
Lightweight

Cons:

Can puncture
Can be unstable
Inflation must be monitored
Pressure varies with altitude and temperature changes

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Other materials

- Plastic
- Brock foam

Stimulite

Ride Designs

45

Hybrids

- Materials can be combined, as well

Varilite

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Questions?

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Case Study

- Tom
- 51 years old
- C2 SCI, new injury
- PWC
- Seating System

Quantum Rehab Edge

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Case Study

Determining Risk:

What are his risk factors?

Lack of sensation

Inability to shift weight independently

Heat

Moisture

Sheer

Transfers

Other positions outside of the PWC

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Case Study

- Seating Considerations
  - Distributing pressure
    - Pressure mapping
  - Off loading
    - Weight shifts
    - Off loading cushion
  - Redistributing pressure
    - Weight shifts

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Questions?

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Pressure Resources

- National Pressure Ulcer Advisory Panel
  - http://www.npuap.org
  - Under Resources:
    - Educational and Clinical Resources

NATIONAL PRESSURE ULCER ADVISORY PANEL

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CONTINUED

References:

1. National Pressure Ulcer Advisory Panel
   www.npuap.org
2. PVA Consortium of Spinal Cord Medicine, Pressure Ulcer Prevention and Treatment Following Spinal Cord Injury, 2nd edition, A Clinical Practice Guideline for Health-Care Providers
3. Brienza, D. (2018). Research Sheds New Light on What Causes Pressure Injuries, Directions, pg. 34-41.

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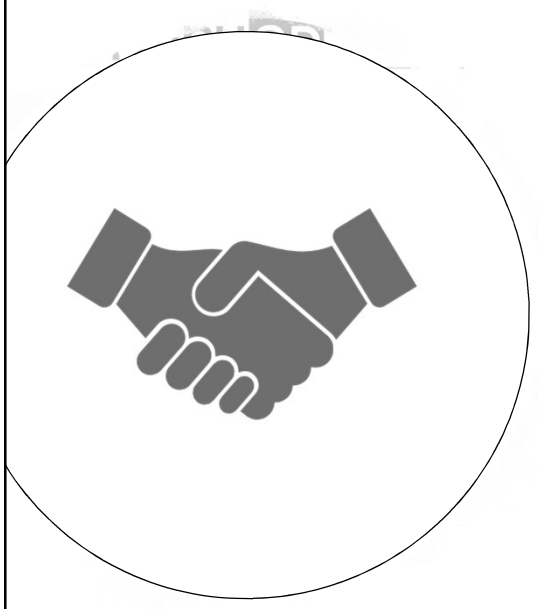

Thank You!

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CONTINUED

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