Saving Face
Strategies to reduce skin breakdown during noninvasive ventilation (NIV) for patient care
Objectives

• Define the key factors that can lead to mask-related NIV complications
• Define ways to manage and reduce the potential of skin breakdown during NIV
• Provide ways to improve patient care by reducing the potential of skin breakdown
• Discuss best practices for initial patient assessment and documentation
• Offer strategies for providing better patient comfort
“It is no exaggeration to say that NIV has revolutionized the treatment of acute respiratory failure.”

1 Scott K. Epstein, MD. *Respiratory Care, January 2009 Vol 54 No 1.*
Centers for Medicare & Medicaid Services

CMS classified Stage III and IV pressure ulcers as a preventable Hospital Acquired Condition (HAC)\(^2\)

These are no longer reimbursed by current insurance guidelines\(^1\)

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\(^1\) Epstein, Scott K., M.D. Noninvasive ventilation to shorten the duration of mechanical ventilation; Respiratory Care. January, 2009, Vol. 54 No. 1

How are pressure injuries impacting your facility?

- Difficult to manage
- Costly
- A cause for litigation

Requires a multidisciplinary approach, from Administration to the bedside clinician.
What is a pressure injury?

A localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear.
Incidence of skin breakdown

- Skin breakdown “... even after only a few hours of ventilation, is a frequent complication, ranging from 2-23%”¹
- “In one study, where patients were continuously ventilated with a face mask for more than 48 hours, this percentage reached 70%”²

¹ Epstein, Scott K., M.D. Noninvasive ventilation to shorten the duration of mechanical ventilation; Respiratory Care, January, 2009, Vol. 54 No. 1
² Armour-Burton, T., Field, W., Outlaw, L., Deleon, E. The Healthy Skin Project: Changing Nursing Practice to Prevent and Treat. Critical Care Nurse, Vol 33, No. 3, June 2013
Incidence of skin breakdown

- Localized areas of tissue necrosis
- Develop when soft tissue is compressed between a bony prominence surface for an extended period of time

1 Epstein, Scott K., M.D. Noninvasive ventilation to shorten the duration of mechanical ventilation; Respiratory Care, January, 2009, Vol. 54 No. 1

Most common on bridge of nose

Extreme cases involve surrounding areas, like over the nose but also on the chin
What causes a pressure injury?

The primary causes are:\(^3\):
- Shearing forces:
  - Cause stretching, kinking, and tearing in the subcutaneous tissues
  - Lead to deeper tissue necrosis
- Excessive compressive pressure (CP)
  - CP should be < diastolic BP
  - CP should be < capillary BP (32-45 mmHg)

Risk increases with:\(^3\):
- Duration of pressure exposure
- Pressure over bony prominences

\(^3\) DeFloor, T. The risk of pressure sores: a conceptual scheme; *Jour of Clin Nursing* 1999;8:206-216.
Skin anatomy and physiology

• **Epidermis**
  – The outer layer of skin sheds every 21 days

• **Dermis**
  – The middle layer of skin contains nerve endings, blood vessels, oil glands, sweat glands
  – collagen and elastin

• **Hypodermis**
  – The subcutaneous layer of skin; fat and connective tissue that houses larger blood vessels and nerves

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4 National Pressure Ulcer Advisory Panel (NPUAP) www.npuap.org.
Pressure injury - Stage 1

• Intact skin with non-blanchable redness
• A change in the skin temperature (warm or coolness)
• Tissue consistency has a firm or boggy feel
• Possible patient sensation pain or itching

4 National Pressure Ulcer Advisory Panel (NPUAP) www.npuap.org.
Stage 1 Pressure Injury
Pressure injury - Stage 2

• Partial thickness loss of skin involving epidermis and/or dermis

• Presents as an intact or open serum filled blister or shallow crater

4 National Pressure Ulcer Advisory Panel (NPUAP) www.npuap.org.
Pressure injury - Stage 3

• Full thickness tissue loss involving damage to or necrosis of subcutaneous tissue
• May extend down to, but not through, underlying fascia
• Presents as a deep crater which may include undermining or tunneling

4 National Pressure Ulcer Advisory Panel (NPUAP) www.npuap.org.
Pressure injury - Stage 4

- Full thickness tissue loss with extensive destruction
- Exposed bone, muscle or tendon
- Some slough or eschar may be present

4 National Pressure Ulcer Advisory Panel (NPUAP) www.npuap.org.
Risk factors for hospital-acquired pressure ulcers\(^5\) (HAPU)

- Age
- Trauma from friction and shearing forces
- Poor nutrition
- Low blood pressure (low perfusion)
- Extended use of NIV

Considerations for mask selection

Did you know?
Up to 37.5% of NIV failures are related to the mask intolerance and discomfort\(^6\)

Mask design considerations

- Estimated length of use
- Compatibility with NIV device
- Mask safety features
  - Quick release clips
  - Anti-asphyxia valves
- Facial features
  - Skin condition
  - Facial abnormalities
- Elbow / Ventilator compatibility
  - EE
  - SE

Patient considerations

- Mouth breather
- Claustrophobic
- Level of consciousness
- Cooperation
- Facial structure
- Elbow style
- Size matters

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Choosing the right mask for your patient

- Mask types
- Headgear selection
- Soft, self-sealing cushions
- Anti-asphyxia features
Initial assessment

- All patients should be assessed for skin integrity upon admission
- Assessment of risk factors for HAPU should also be determined on admission and prior to NIV initiation
- Assess the patient using the Braden scale
- Relative risk should determine monitoring frequency and prevention strategy
Polling question

Is your hospital using some type of skin assessment protocol?
Patient assessment

1. MD Order for BiPAP
2. Huddle with nursing
3. Skin Breakdown Risk Factors
   - Should ANY of the following criteria apply the patient is at HIGH RISK:
     - Vasopressors
     - Chronic steroid therapy
     - Fragile or edematous skin on face
   - A patient who has any FOUR of the following criteria should be considered HIGH RISK:
     - Malnutrition
     - Dehydration
     - DNR
     - Neurological Impairment
     - 60yo
     - Dialysis
     - Restraints
     - Braden Scale 18
     - DM
     - Anatomical factors (Bony prominences)
     - Current skin breakdown elsewhere on body
     - COPD
4. Apply Alternative BiPAP Masks
   - Total Face Mask
   - Gel Face Mask
   - Alternate between Total + full Masks q4.
5. Initiate BiPAP bundle
   - Perform Subsequent Skin Assessment/document (q2).
   - Perform Appropriate Mask Sizing + documented
   - Perform Exhalation Port Test.
   - Apply Facility Approved protective foam dressing.
   - Perform / Assess Mask Leak
6. Perform & Document Skin Integrity Risk Assessment
   - Pass? Go to step 3
   - Fail? Notify Supervisor and remove from service.
   - Leak? >10 but <25 Proceed and monitor as indicated
   - Leak? <10 Adjust mask and loosen if necessary
7. Perform BiPAP
8. Document

(Protocol granted with permission)
Mask rotation practices

By rotating mask designs, the pressure points are redistributed to help reduce the potential for skin breakdown
Best practices

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Visit www.thinkniv.com
Noninvasive ventilation masks are associated with pressure injuries under the mask

Sampling
- 5 ICUs (111 ICU beds)
- Recruited 200 patients with NIV orders
  - First 100 patients received Oro-nasal mask
  - Second 100 patients received Full-face mask

Education
- Therapists and nurses practiced application and proper adjustments of the masks on a mannequin.

Patient assessed
- Skin integrity
- Comfort level

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Results

- 20% of patients in the oro-nasal masks developed a pressure injury
- 2% of patients in the full-face masks developed a pressure injury
- Comfort scores significantly lower in the Full-face mask group

Conclusion:
Full-Face mask resulted in significantly fewer pressure injuries and was more comfortable for patients.

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Summary - Helping reduce the potential for pressure injuries

- Assess the patient
- Select the proper mask(s) design
- Rotate designs to redistribute pressure points
- Manage mask leak no less than 7 L/min
- Perform skin care and early interventions
- Conduct continuing education