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
NIV is the standard of care

“It is no exaggeration to say that NIV has revolutionized the treatment of acute respiratory failure.”¹

¹ Scott K. Epstein, MD. *Respiratory Care, January 2009 Vol 54 No 1.*
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%”\(^2\)

\(^{\text{1}}\) Epstein, Scott K., M.D. Noninvasive ventilation to shorten the duration of mechanical ventilation; Respiratory Care, January, 2009, Vol. 54 No. 1
\(^{\text{2}}\) 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

Most common on bridge of nose

Extreme cases involve surrounding areas, like over the nose but also on the chin

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

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\(^3\) 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

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

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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

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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

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

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*Nava, S., Navalesi, P., Gregoretti, C. Interfaces and Humidification for Noninvasive Mechanical Ventilation. Resp. Care, Jan 2009. Vol 54-1*
Patient considerations⁹

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

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**

**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

**Apply Alternative BIPAP Masks**

- Total Face Mask
- Gel Face Mask
- Alternate between Total + full Masks Q4.

**Initiate BiPAP bundle**

1. Perform Subsequent Skin Assessment/document (Q2).
2. Perform Appropriate Mask Sizing + documented
3. Perform Exhalation Port Test.
4. Apply Facility Approved protective foam dressing.
5. Perform / Assess Mask Leak

**Yes** | **High risk** | **No**
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**Perform & Document Skin Integrity Risk Assessment**

**Initiate Standard Face Mask**

**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

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(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
In literature

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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In literature\textsuperscript{8}

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.

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