Saving Face

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

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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.*

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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]

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

[2] Gregoretti. C., Confalonieri, M., Navalesi, P., Squadrone, V., Frigerio, V., Frigerio, P., Beltrame, F., Carbone, G., Conti, G., Gamna, F., Nava, S., Calderini, E., Skrobik, Y., Antonelli, M.Evaluation of patient skin breakdown and comfort with a new face mask for non-invasive ventilation: a multi-center study. Intensive Care Medicine 2002; 28:278-284

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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.

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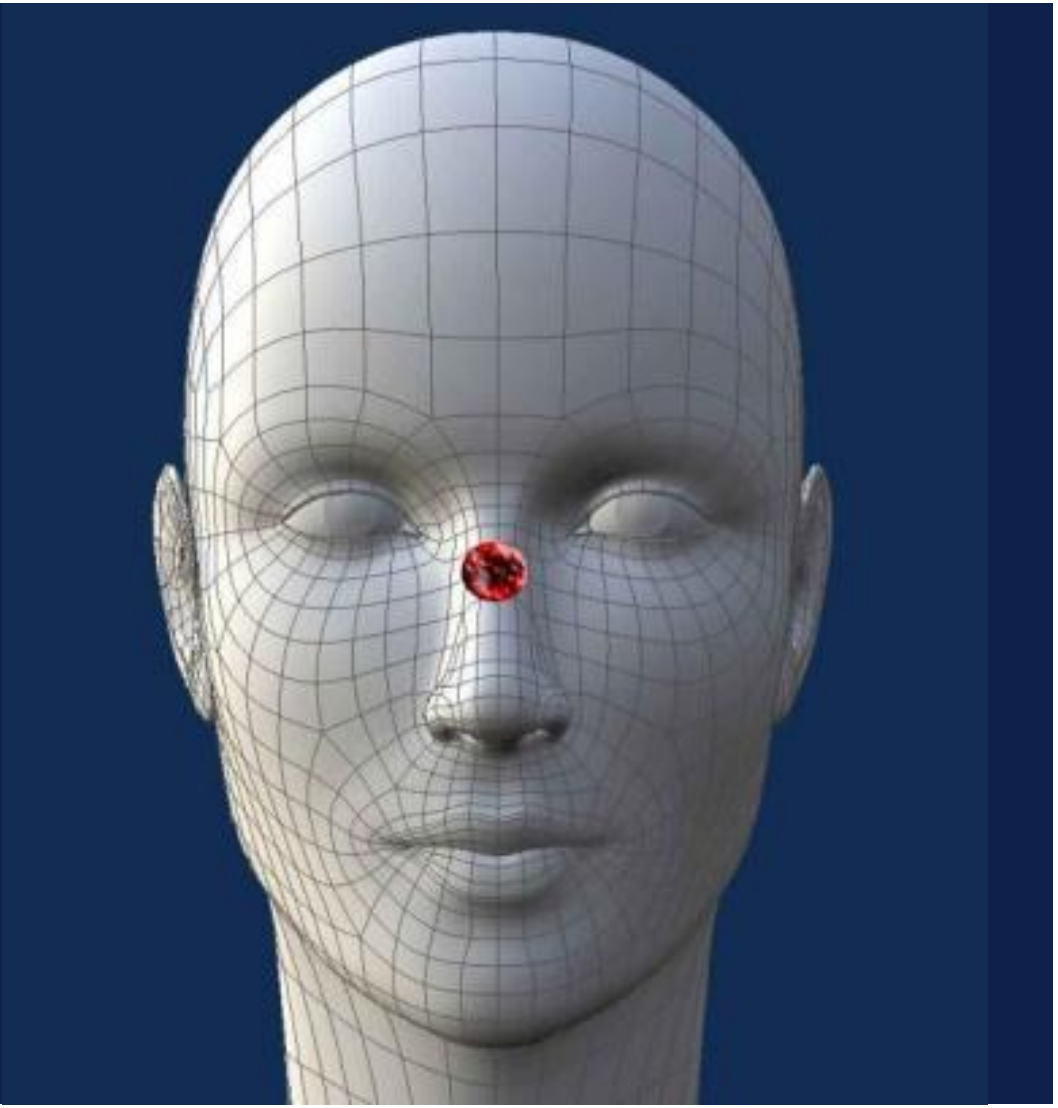
What is a pressure injury?

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.



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Mask rotation practices

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

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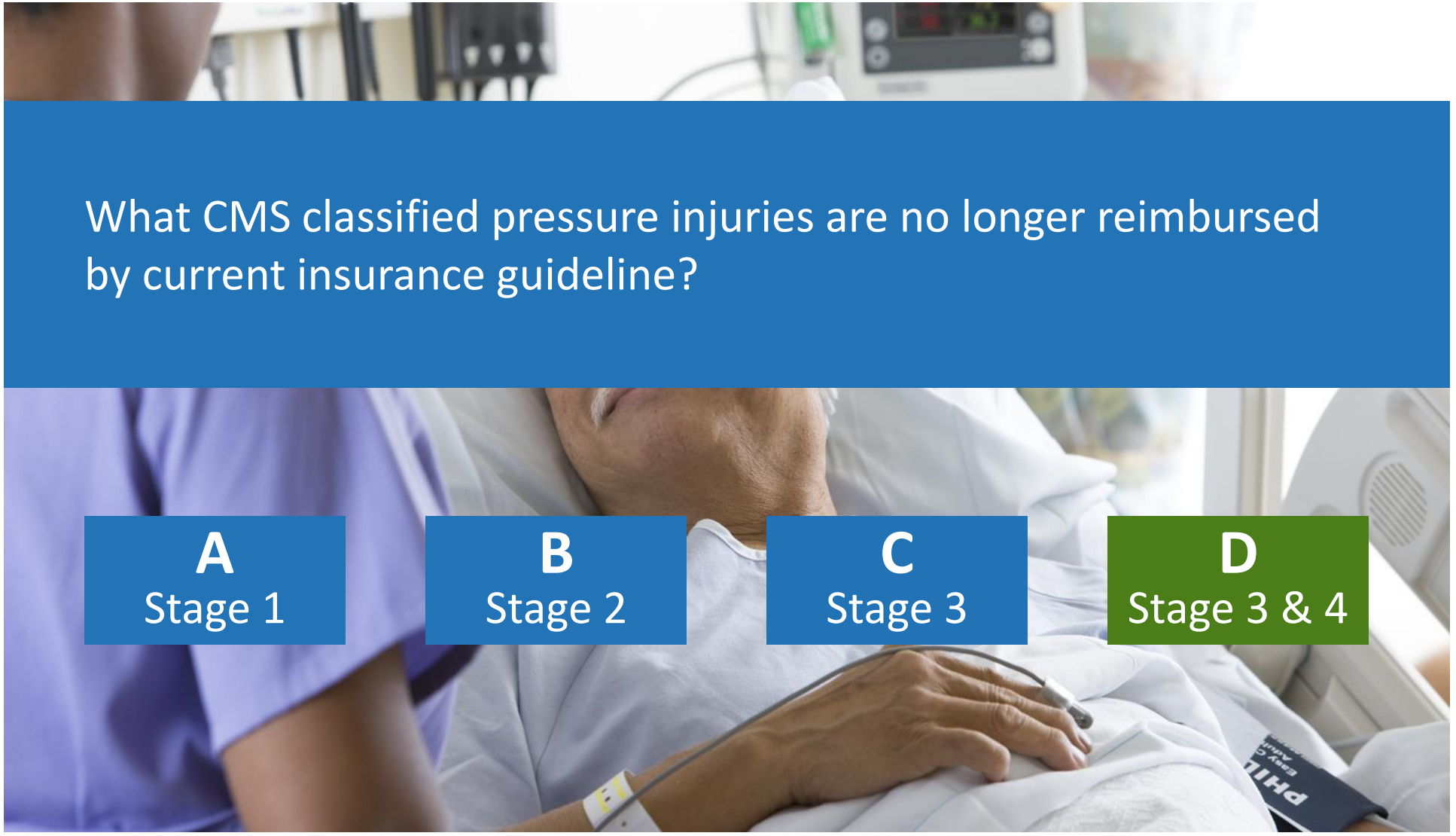
Polling question



What CMS classified pressure injuries are no longer reimbursed by current insurance guideline?

A
Stage 1

B
Stage 2

C
Stage 3

D
Stage 3 & 4

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Mask Complications

Identifying Patient Risk Factors

Patient Assessment

Wound Reduction

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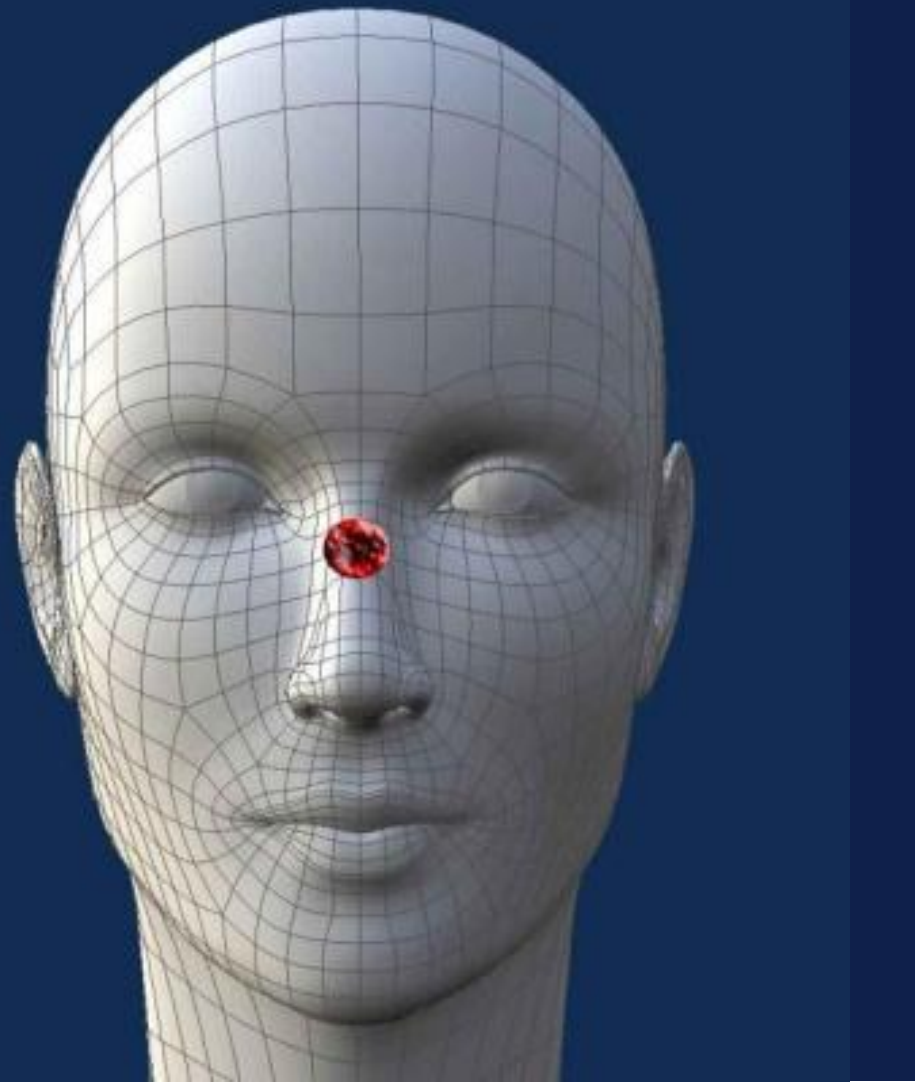
Incidence of skin breakdown

- 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

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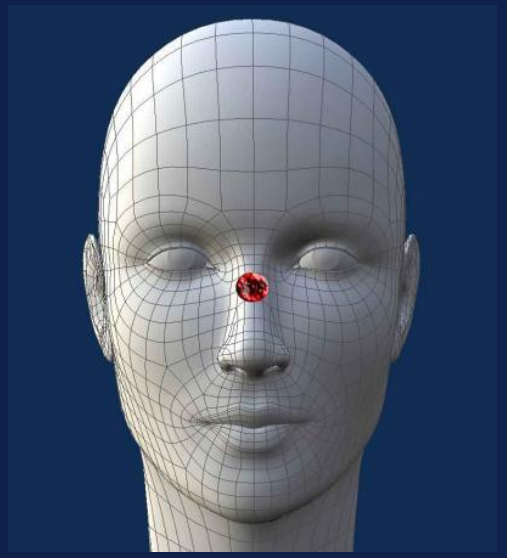
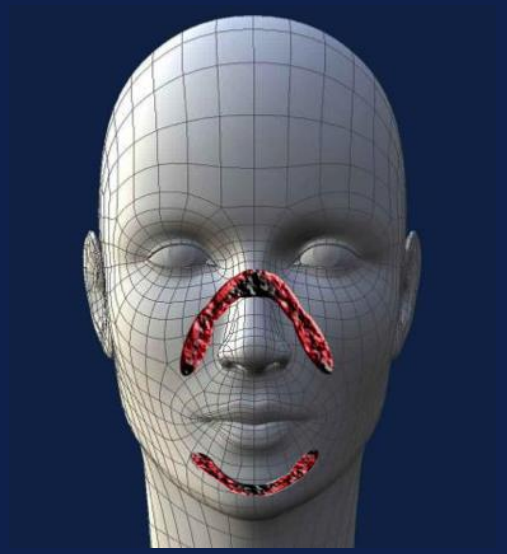
Incidence of skin breakdown

- 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[1]



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

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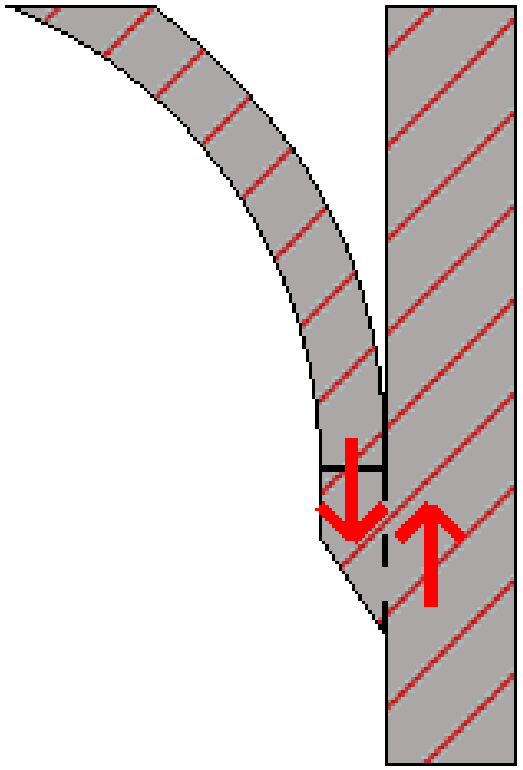
What causes a pressure injury?

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



Shearing forces

[3] DeFloor, T. The risk of pressure sores: a conceptual scheme; *Jour of Clin Nursing* 1999;8:206-216.

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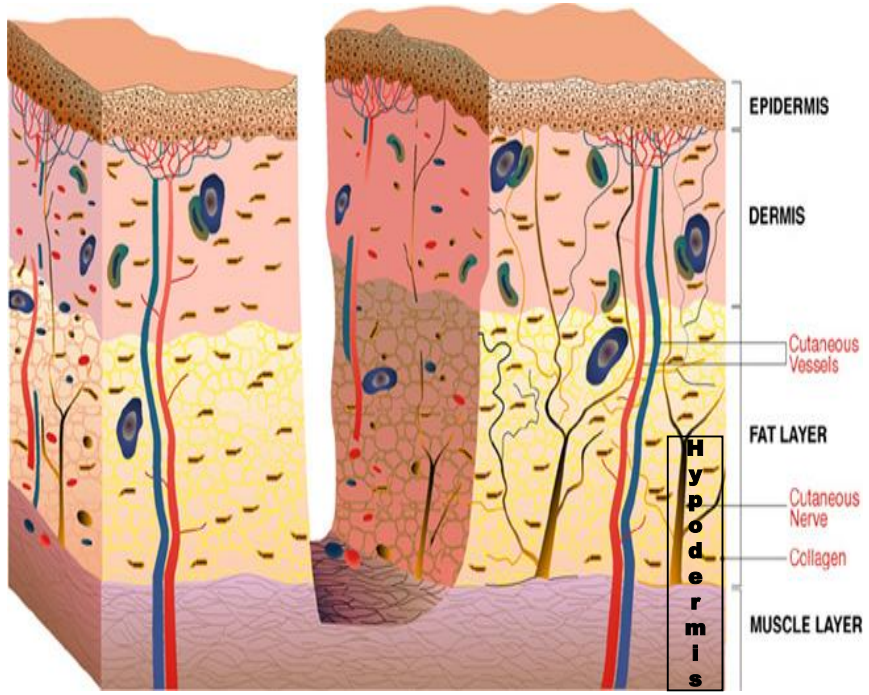
Skin anatomy and physiology[4]

- 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



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

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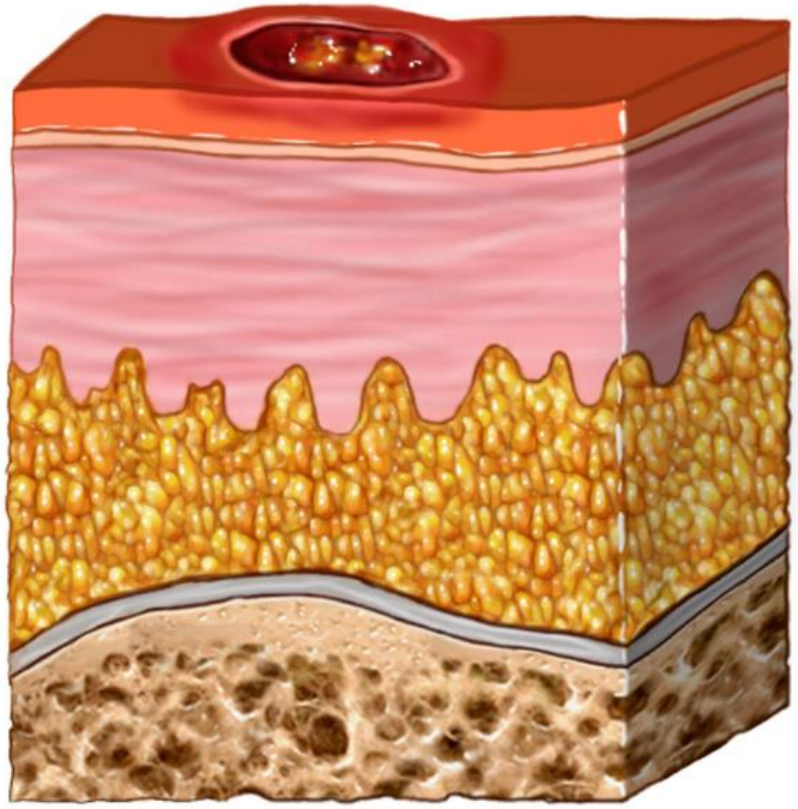
Pressure injury - Stage 1[4]

- 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.

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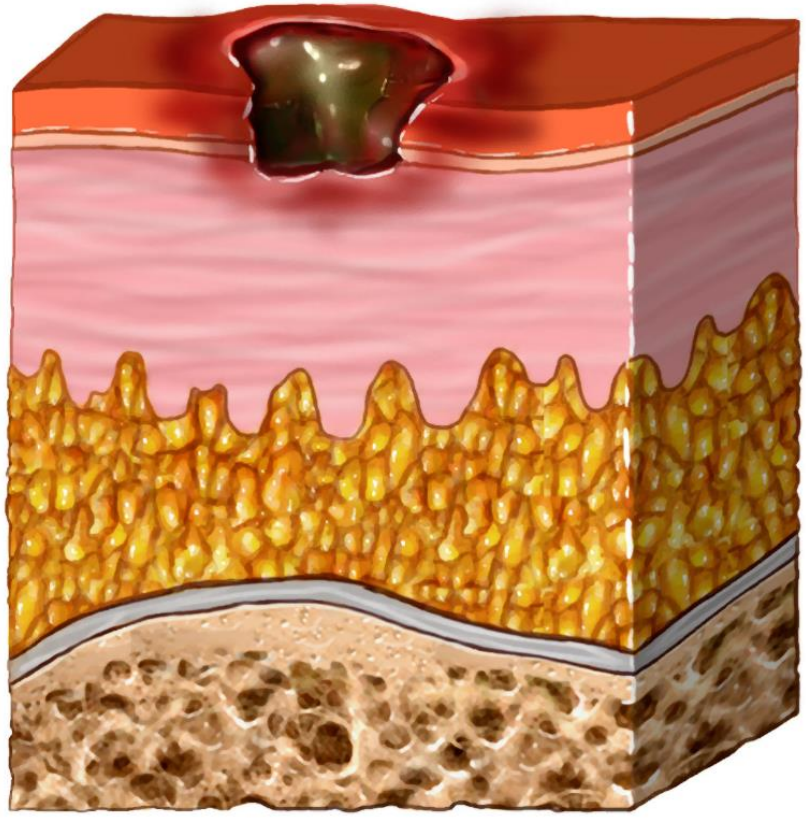
Pressure injury - Stage 2[4]

- Partial thickness loss of skin involving epidermis and/or dermis
- Presents as a intact or open serum filled blister or shallow crater



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

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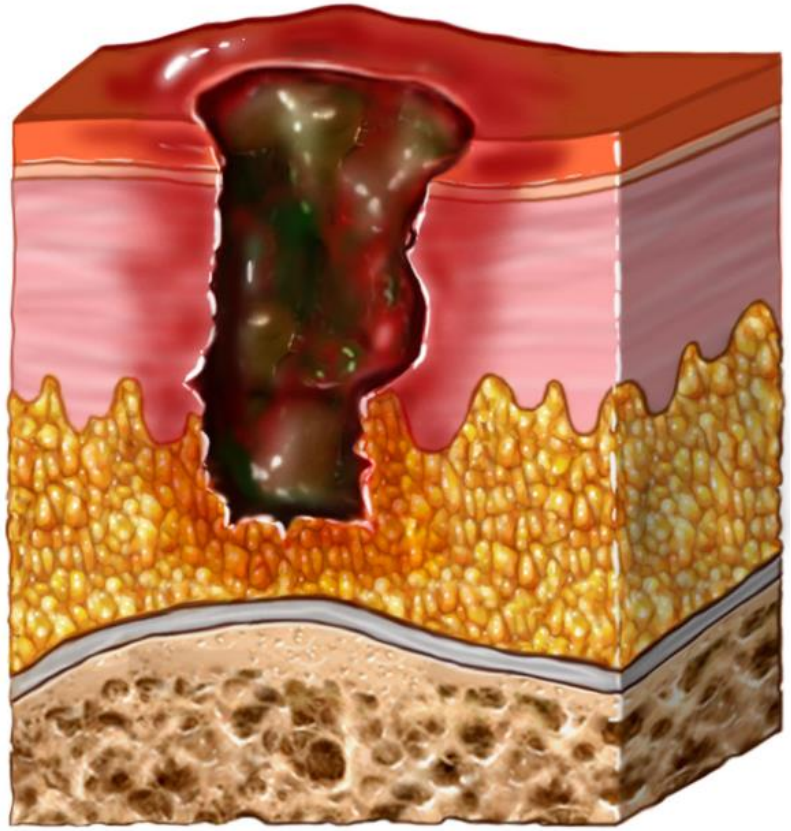
Pressure injury - Stage 3[4]

- 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.

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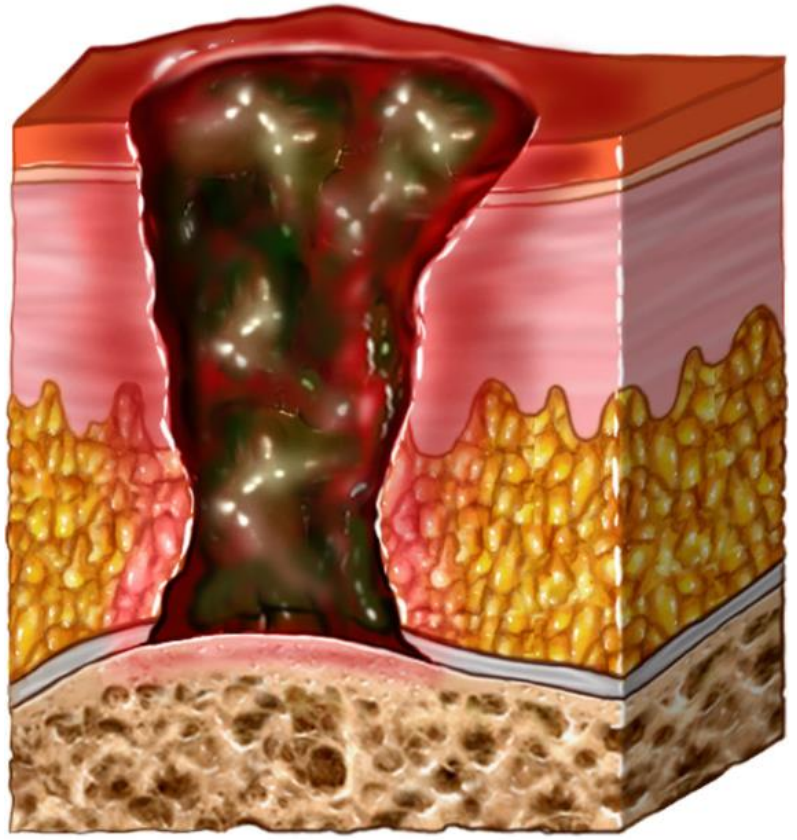
Pressure injury - Stage 4[4]

- 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.

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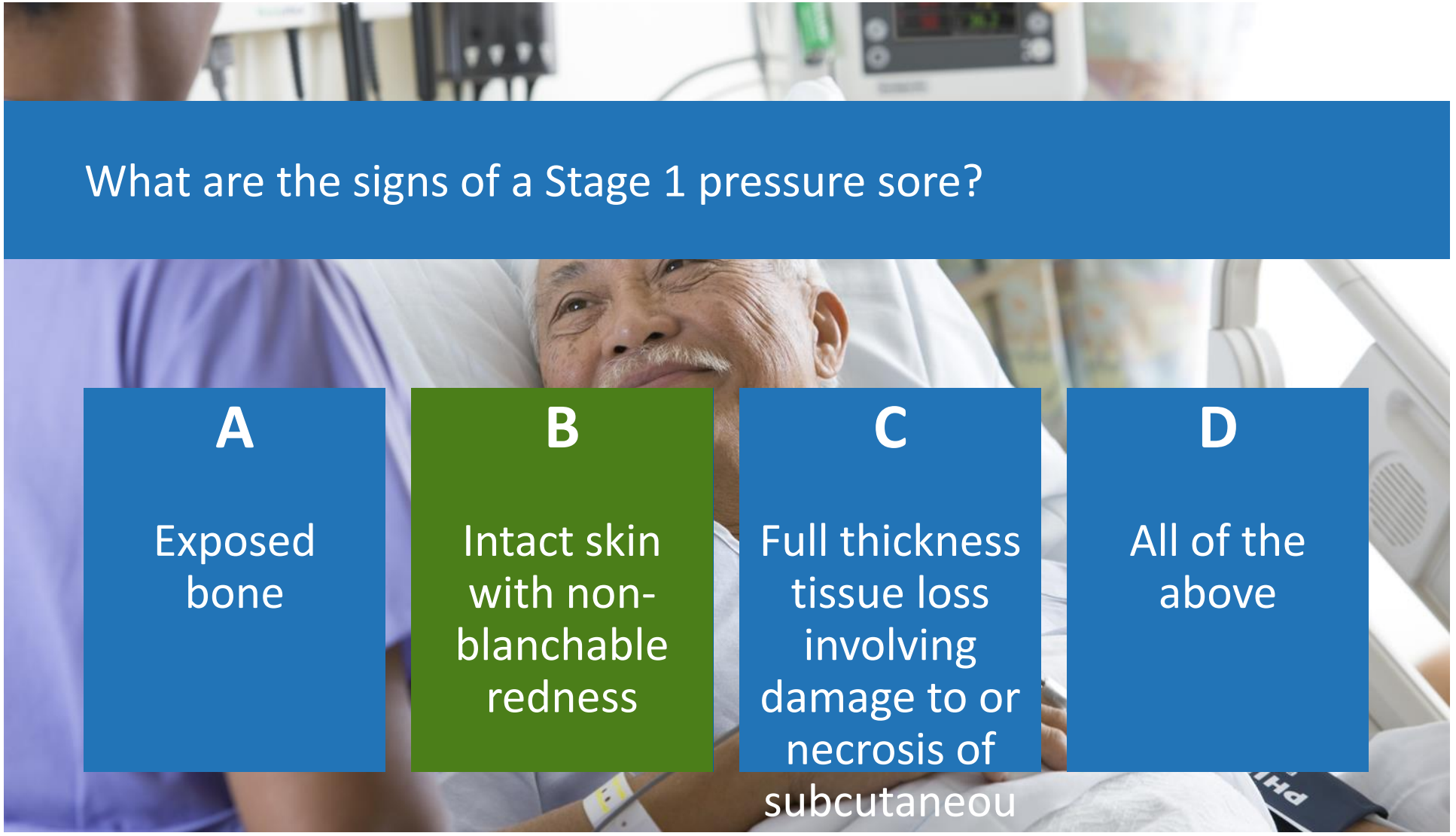
Pressure injury - Stage 4[4]



What are the signs of a Stage 1 pressure sore?

A

Exposed bone

B

Intact skin with non-blanchable redness

C

Full thickness tissue loss involving damage to or necrosis of subcutaneou

D

All of the above

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

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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

[5] NPUAP-EPUAP-Prevention and treatment of Pressure Ulcers: Quick reference guide. Oct.16, 2014

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Considerations for mask selection

[6] Squardone, E., Frigerio, P., Fogliati, C., Gregoretti, C., Conti, G., Anonelli, M., Costa, R., Baiardi, P., Navalesi, P. Noninvasive vs invasive ventilation in COPD patients with severe acute respiratory failure. Intensive Care Med (2004) 30: 1303-1310.

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Clinical considerations

Clinicians remove and reposition masks many times per day for[7]

- Oral care
- Medication administration
- Hydration
- Therapy break

[7] G Hilbert, D Gruson, F Vargas, R Valentino, L Portel, G Gbikpi-Benissan, JP Cardinaud. Noninvasive ventilation for acute respiratory failure. Quite low time consumption for nurses. European Respiratory Journal 2000 16: 710-716

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Mask design considerations[8]

- 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

[8] Nava, S., Navalesi, P., Gregoretti, C. Interfaces and Humidification for Noninvasive Mechanical Ventilation. Resp. Care. Jan 2009. Vol 54-1

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Patient considerations[9]

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

[9] Nava, S., Hill, N., Non-invasive ventilation in acute respiratory failure. Lancet 2009;374-250-59.

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Choosing the right mask for your patient

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

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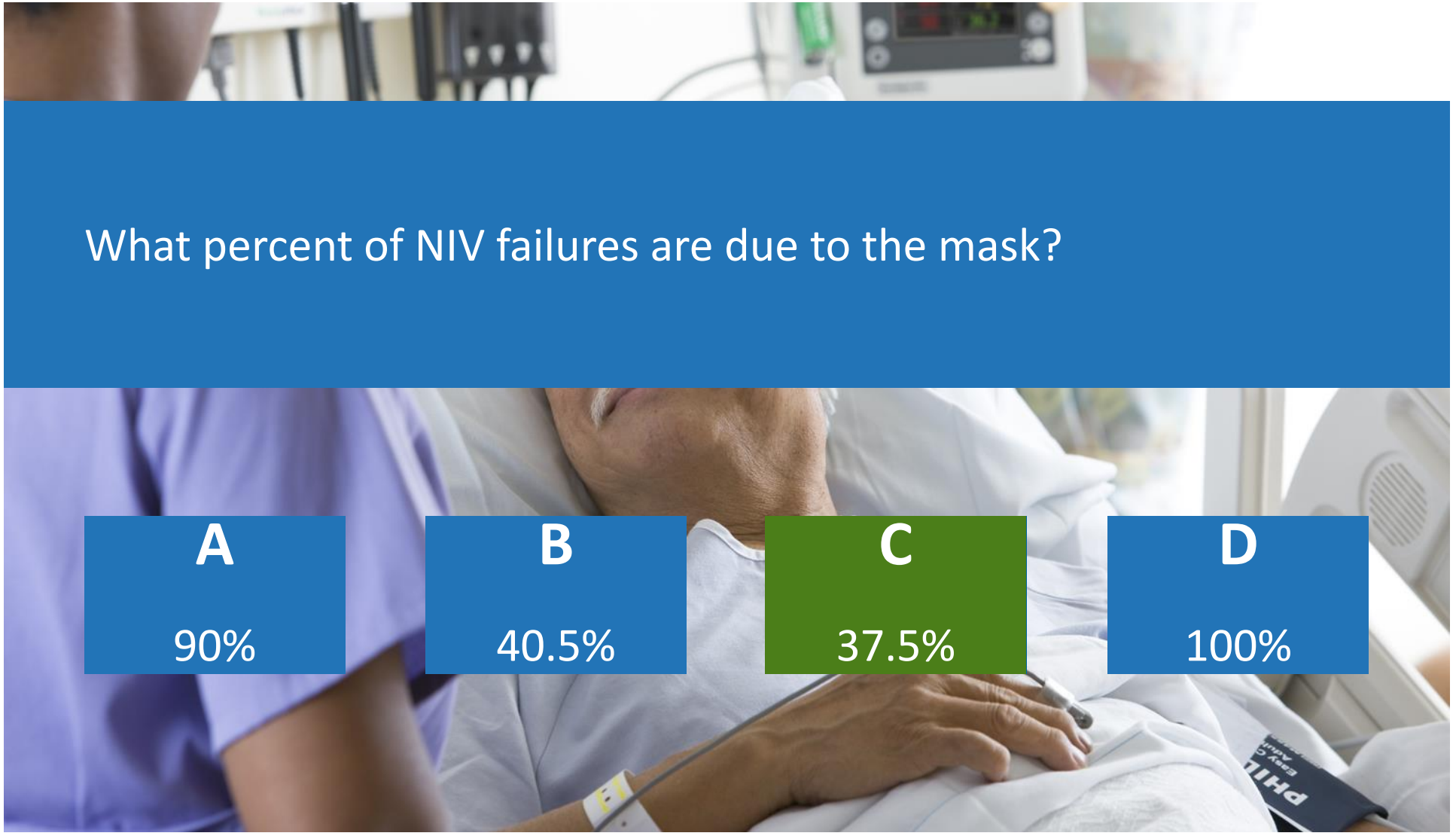
Polling question



What percent of NIV failures are due to the mask?

A	B	C	D
90%	40.5%	37.5%	100%

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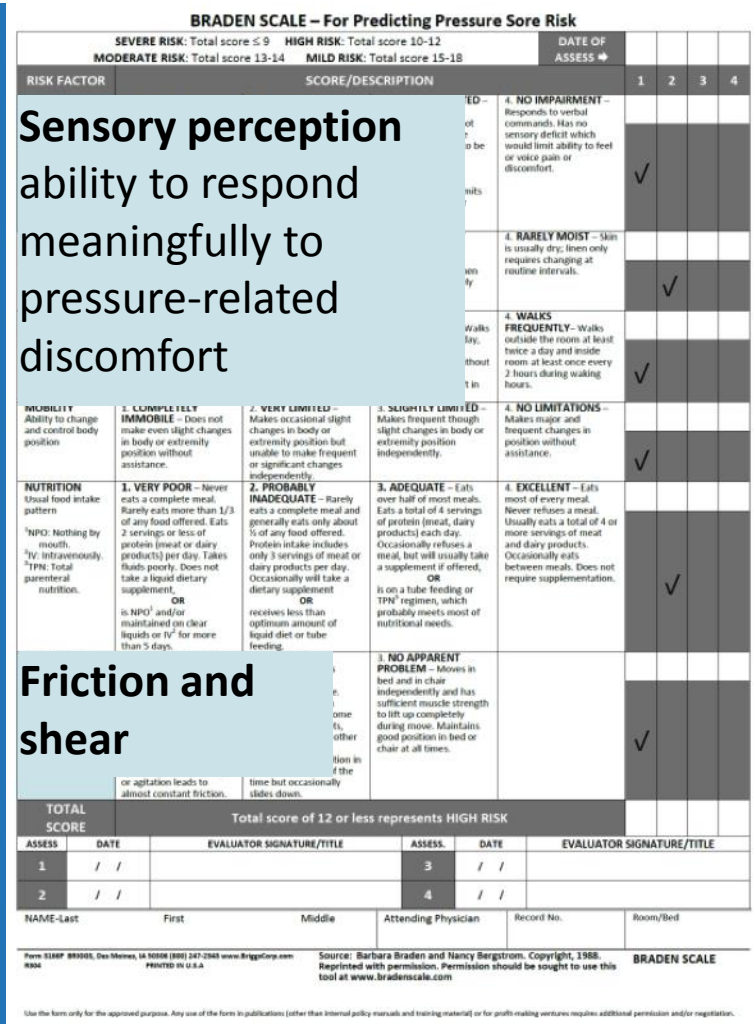
Initial assessment



BRADEN SCALE – For Predicting Pressure Sore Risk

SEVERE RISK: Total score ≤ 9 **HIGH RISK**: Total score 10-12
MODERATE RISK: Total score 13-14 **MILD RISK**: Total score 15-18

DATE OF ASSESS ➡

RISK FACTOR	SCORE/DESCRIPTION				1	2	3	4
Sensory perception ability to respond meaningfully to pressure-related discomfort				4. **NO IMPAIRMENT** – Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.	✓			
				4. **RARELY MOIST** – Skin is usually dry; linen only requires changing at routine intervals.		✓		
				4. **WALKS FREQUENTLY** – Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.	✓			
MOBILITY Ability to change and control body position	1. **COMPLETELY IMMOBILE** – Does not make even slight changes in body or extremity position without assistance.	2. **VERY LIMITED** – Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	3. **SLIGHTLY LIMITED** – Makes frequent though slight changes in body or extremity position independently.	4. **NO LIMITATIONS** – Makes major and frequent changes in position without assistance.	✓			
NUTRITION Usual food intake pattern [1]NPO: Nothing by mouth. [2]IV: Intravenously. [3]TPN: Total parenteral nutrition.	1. **VERY POOR** – Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, **OR** is NPO[1] and/or maintained on clear liquids or IV[2] for more than 5 days.	2. **PROBABLY INADEQUATE** – Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement **OR** receives less than optimum amount of liquid diet or tube feeding.	3. **ADEQUATE** – Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally refuses a meal, but will usually take a supplement if offered, **OR** is on a tube feeding or TPN[3] regimen, which probably meets most of nutritional needs.	4. **EXCELLENT** – Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.		✓		
Friction and shear	or agitation leads to almost constant friction.	time but occasionally slides down.	3. **NO APPARENT PROBLEM** – Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.		✓			
TOTAL SCORE	Total score of 12 or less represents HIGH RISK							

ASSESS	DATE	EVALUATOR SIGNATURE/TITLE	ASSESS.	DATE	EVALUATOR SIGNATURE/TITLE
1	/ /		3	/ /	
2	/ /		4	/ /	

NAME-Last First Middle | Attending Physician | Record No. | Room/Bed

Source: Barbara Braden and Nancy Bergstrom. Copyright, 1988. Reprinted with permission. Permission should be sought to use this tool at www.bradenscale.com

BRADEN SCALE

- 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

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Polling question

Is your hospital using some type of skin assessment protocol?

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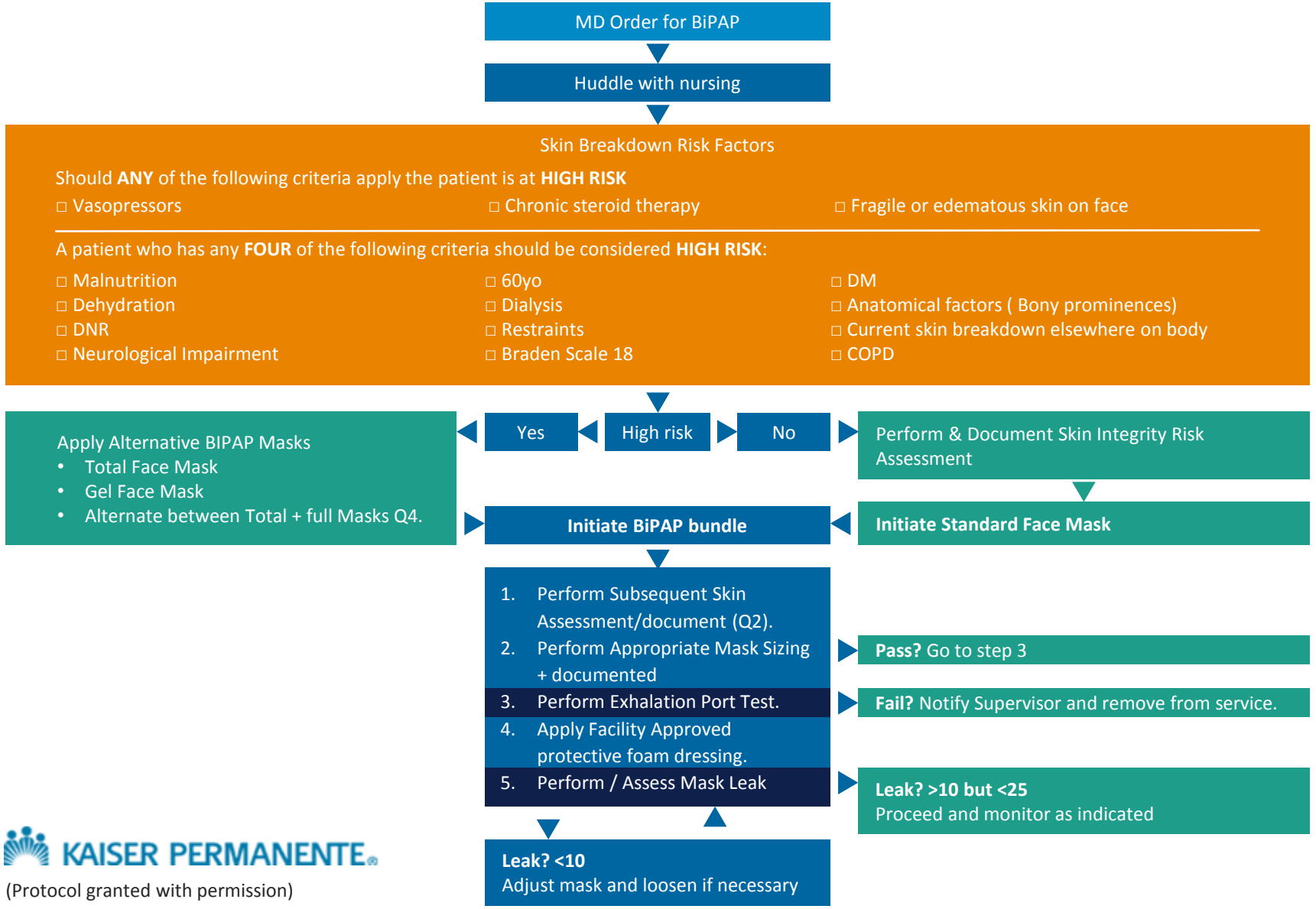
Patient assessment



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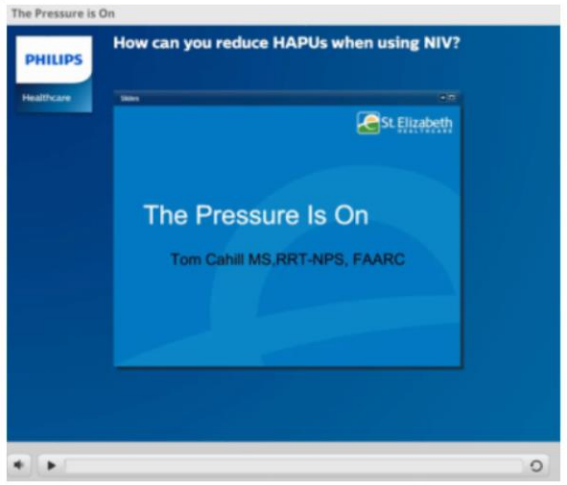
Best practices

Saving Face

Strategies to reduce skin breakdown during NIV for patient care



Visit www.thinkniv.com

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- In literature[8]

Noninvasive ventilation masks are associated with pressure injuries under the mask

Sampling

[8] Squardone, E., Frigerio, P., Fogliati, C., Gregoretti, C., Conti, G., Anonelli, M., Costa, R., Baiardi, P., Navalesi, P. Noninvasive vs invasive ventilation in COPD patients with severe acute respiratory failure. Intensive Care Med (2004) 30: 1303-1310..

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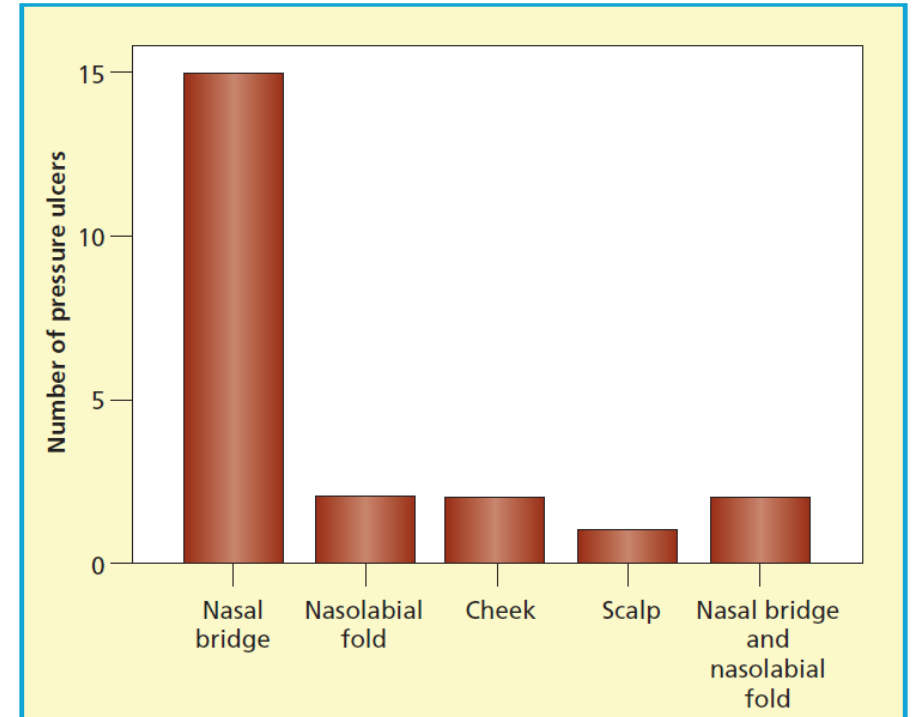

Figure 2 Location of pressure ulcers.

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.

[8] Schallom M, Cracchiolo L, Falker A. Pressure ulcer incidence in patients wearing nasal-oral versus full-face noninvasive ventilation masks. American Journal of Critical Care Medicine. 2015;24(4):349-356.

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• NIV advantages over invasive

Application

- Avoid Intubation
  - Patient discomfort
  - Upper airway trauma

Ventilator acquired pneumonia (VAP)[9]

  - Intubation is associated with GI bleeding
  - Less chance of barotrauma
- Decreases work of breathing
  - Improves alveolar ventilation
  - Improves gas exchange
  - Counterbalances intrinsic PEEP
- Improve patient-ventilator synchrony

Epstein, Scott K., M.D. Noninvasive ventilation to shorten the duration of mechanical ventilation; Respiratory Care, January, 2009, Vol. 54 No. 1
Hess, D. Noninvasive Positive Pressure Ventilation and Ventilation Associated Pneumonia. Respiratory Care, July, 2005, Vol. 50. No. 7924-931

• NIV advantages over invasive

Oral patency

- Preserves efficiency of cough and secretion clearance
- Allow speech, allowing the patient to communicate
- Preserves ability to swallow
- Reduces need for NG tube

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

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