NON-INVASIVE VENTILATION AND SKIN INTEGRITY: GETTING THEM BOTH RIGHT

Rena Laliberte BS, RRT
Clinical Education Specialist
Henry Ford Hospital - Detroit

1

DISCLOSURES

- I do receive an honorarium from Respiratory Associates to present this topic
- Any reference or image of any product or equipment is for educational purposes only and not an endorsement
- I have no other disclosures

2

LEARNING OUTCOMES

After this course, participants will be able to:

- Discuss the primary reasons NPPV fails despite strong evidence-based research
- Identify modes and parameter selection when using BiPAP or CPAP
- List potential barriers for use and titration strategies for weaning
- Discuss the differences between HHFNC, and other available equipment
- Review pressure ulcer staging and identification
- Examine various treatment options and avoidance of pressure ulcers

3

NON-INVASIVE POSITIVE PRESSURE VENTILATION

- Non-Invasive Positive Pressure Ventilation (the absence of an artificial airway, utilizing a mask or other interface) has been used since the 1980's
- Since then, it has been the subject of numerous randomized clinical trials and its use in Acute Hypercapnic Respiratory and Hypoxemia Failure have been well documented.
- For the purposes of this lecture, will focus on the acute aspects of the use of NIV.
- Despite the most current evidence with supporting clinical practice updates and guidelines, NIV remains a technically difficult therapy to truly learn well enough to utilize to its fullest potential for success in our patients.
- Knowledgeable Respiratory Therapists and other Licensed Healthcare providers can be instrumental in proper patient selection, initiation and management of Acute NIV.

4

WHY DOES NIPPV FAIL?

Utilization of Noninvasive Ventilation in Acute Care Hospitals: A Regional Survey Chest (Maheshwari et al., 2006)

- A search of the most credible search engines (Cochrane etc.) utilizing key term "lack of knowledge in non-invasive ventilation" elicited thousands of responses
- What does the evidence show?

5

WHY DOES NIPPV FAIL? REVIEW THE LITERATURE

- We obtained responses from 71 of the 82 hospitals (88%)
- The overall utilization rate for NPPV was 20% of ventilator starts, but we found enormous variation in the estimated utilization rates among different hospitals, from none to > 50%
- The top two reasons given for lower utilization rates were a lack of physician knowledge and inadequate equipment
- In the 19 hospitals that provided detailed information, COPD and **congestive heart failure** constituted 82% of the diagnoses of patients receiving NPPV, but NPPV was still used in only 33% of patients with these diagnoses receiving any form of **mechanical ventilation**(Maheshwari et al., 2006)

6

WHY DOES NIPPV FAIL?

Evidence-based Utilization of Noninvasive Ventilation and Patient Outcomes

- Results
  - **Among 22,706 hospitalizations with NIV as the initial ventilatory strategy, 6,820 (30.0%) had SECs. (SEC- strong evidence conditions)**
  - **Patients with SECs had lower risk of NIV failure than patients with weak evidence conditions (8.1 vs. 18.2%, *P* < 0.0001).**
  - Regardless of underlying diagnosis, patients admitted to hospitals with greater use of NIV for SECs had lower risk of NIV failure (Quartile 4 vs. Quartile 1 adjusted odds ratio = 0.62; 95% CI = 0.49–0.80). **aOR = adjusted odds ratio**
  - Even patients without an SEC benefited from admission to hospitals that used NIV more often for patients with SECs (Quartile 4 vs. Quartile 1 adjusted odds ratio for NIV failure = 0.68; 95% CI = 0.52–0.88)

Mehta et al., 2017

7

WHY DOES NIPPV FAIL?

Evidence-based Utilization of Noninvasive Ventilation and Patient Outcomes

- **Conclusions**
  - **<u>Most patients who received NIV did not have conditions with strong supporting evidence for its use with wide institutional variation in patient selection for NIV.</u>**
  - Surprisingly, we found that all patients, even those without an SEC, benefited from admission to hospitals with greater evidence-based utilization of NIV, suggesting a "hospital effect" that is synergistic with patient selection

- Mehta et al., 2017

8

WHY DOES NIPPV FAIL?

Patient Outcomes/study summary

- Overall, 15.2% of patients failed initial treatment with NIV and subsequently required IMV
  - **Patients with SECs had significantly lower risks for NIV failure (8.1 vs. 18.2%; adjusted OR [aOR] = 0.21; 95% CI = 0.14–0.32)**
  - **A patient's risk of NIV failure was lower when admitted to hospitals with higher NIV-SEC rates (Quartile 4 vs. Quartile 1 aOR = 0.65; 95% CI = 0.50–0.83) CI=confidence interval**
  - **In a subgroup analysis, patients without an SEC also had lower risk of NIV failure when admitted to hospitals with higher NIV-SEC rates** (Quartile 4 vs. Quartile 1 aOR = 0.68; 95% CI = 0.52–0.88)

9

WHY DOES NIPPV FAIL?

- Mortality among patients who suffered NIV failure was higher than those treated initially with IMV (39.4 vs. 31.0%; aOR = 1.49; 95% CI = 1.38–1.62)
  - **Among patients who failed initial NIV treatment, those with SECs had lower hospital mortality compared with patients with conditions with weak evidence for NIV use** (11.1 vs. 28.7%; aOR = 0.44; 95% CI = 0.29–0.65)
  - Patients who received NIV at hospitals with higher NIV-SEC rates tended to have lower hospital mortality rates than patients receiving NIV at low NIV-SEC rate hospitals (Quartile 4 vs. Quartile 1 aOR = 0.83; 95% CI = 0.68–1.00)

10

PATIENT SELECTION

- Best Evidence (Strong Evidence Condition)
  - Exacerbation of COPD (Impending Respiratory Failure, hypercapnia, respiratory acidosis)
  - Congestive Heart Failure
  - Post extubation support
  - Obesity and obesity hyperventilation syndrome
  - Chest wall abnormalities and Neuromuscular diseases, Palliative Care, DNI patients
- Low Level of Evidence
  - Hypoxemic Failure (**Covid 19)
  - Sepsis
  - Pneumonia
  - Asthma

11

PATIENT SELECTION

- Absolute Contraindications
  - Shock
  - Hemodynamic instability/cardiac ischemia/arrythmias
  - Multi organ failure
  - ARDS
  - Severe Hypoxemia
  - Recent Upper Airway or GI surgery
  - Impaired Swallow
  - Unable to protect airway
  - Unable to tolerate therapy

12

- Patient's level of consciousness
- Must be able to remove mask unassisted
- Must be able to control secretions
- Use of restraints should be an absolute contraindication
- There is no true "apnea" ventilation – Only a back up rate (explained later in presentation)
- You should not "mask" ventilate patients – For this situation, intubation and IMV should be considered
- Condition should be treatable and reversible within hours or a couple days
- Vomiting, overwhelming pulmonary edema or coughing up blood are all considered contraindications and put patients at risk for aspiration
- Patient must be able to tolerate therapy (claustrophobia and anxiety may be an issue)

IMPORTANT CONSIDERATIONS BEFORE CHOOSING MASK NON-INVASIVE VENTILATION

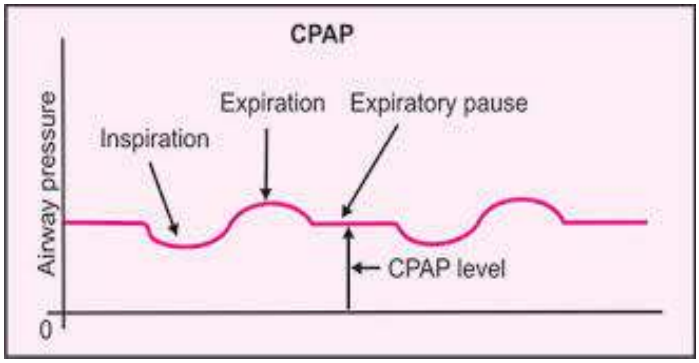
13

CPAP VS. BIPAP

- CPAP
  - Continuous positive airway pressure consisting of some level of PEEP and an FI02
  - Choice for Hypoxemic or "Fluid Events" as in Congestive Heart Failure/ Pulmonary Edema -Similar presentation in patients who have missed hemodialysis
- BiPAP
  - Bi (two) positive airway pressures, EPAP (PEEP) end positive airway pressure and IPAP inspiratory positive airway pressure
  - The Delta pressure between IPAP and EPAP is the level of pressure support that augments tidal volume/minute ventilation
  - Choice for hypercapnia, when Tidal Volume is LOW, RR High and needs to be augmented as in COPD exacerbations (Acute Hypercapnic Respiratory Failure with or without hypoxemia)

14

CPAP (CONTINUOUS POSITIVE AIRWAY PRESSURE)



Pillai, S. A. (2009). *Mechanical Ventilation Made Easy* (1/e ed.). Macmillan Publishers. https://doi.org/10.5005/jp/books/10511_9

15

CPAP

- The decision to choose CPAP ventilation is based on evidence and patient presentation
- Specific pathology, patient assessment and clinical criteria can all be used in decision making
- Most patients requiring CPAP are those patients who present with acute hypoxemic failure with minimal or poor response to continuous oxygen therapy (COT), and long with the following:
  - Orthopnea
  - Pulmonary Congestion on X ray or CT
  - Elevated BNP
  - Congested (crackles) lung auscultation
  - PaO2/FI02<300mmHg
  - Pa02 <60mmHg (Normal or Alkalotic PH)

16

CPAP PARAMETERS

- Mode is Chosen, Where Do We Start?
  - Always best to begin at tolerable pressures and titrated to need
  - Begin at 100% and 5-8cmH20
  - As FI02 is weaned down – if saturation begins to drop, increase the CPAP level in 2cm H20 increments
  - Continue until FI02 is ≤60%
  - Avoid hyperoxia
  - Monitor patients closely for responsiveness to all therapy
  - RT assesses for tolerance and synchrony
  - All patients should be assessed every hour for the first 3 hours. If patient is not responding to therapy and continues to deteriorate, do not delay in moving to IMV

17

CPAP TREATMENT

- Work of breathing in these patients is directly correlated to length of time and degree of hypoxemia
  - Correction of hypoxemia, **usually** will correct work of breathing
  - BiPAP has been used, however if VENTILATION is excessive in these patients, they are at risk for self-induced lung injury (SILI)
    - On minimal settings tidal volumes can easily exceed > 800ml and have been noted as well over 1 Liter, which places these patients in the high risk of failure group

18

CPAP TREATMENT

- Patients can be combative with very high anxiety, Ativan or other medications can be considered; however, they can cause adverse effects including hypoventilation and nausea.
- Heated High Flow Nasal Cannula can also be considered for 'comfort" (no mask) and the ability to use high FI02 and flow rates up to 60L/M (device dependent)
- Patient also maintains the ability to cough and clear secretions in the event pulmonary edema is overwhelming

19

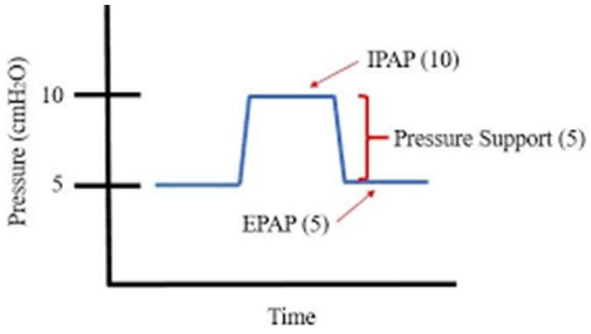
CPAP WEANING

- The decision to wean a patient from CPAP is determined by the following:
  - Improvement in hemodynamics
  - Positive response to diuretics (or completion of dialysis)
  - Improvement in breath sounds
  - Resolution of productive cough
  - Successful weaning of FI02, CPAP level or both
  - Ability to tolerate a trial off mask ventilation without significant increase in work of breathing or recurrence of hypoxia

20

MOU1

BIPAP (TWO POSITIVE AIRWAY PRESSURES)



Britt, D. (2017). *BiPAP Essentials for Prehospital Providers* [Graph]. Www.Emsworld.Com. https://www.emsworld.com/218042/ce-article-bipap-essentials-prehospital-providers

21

BIPAP

- Like CPAP patient selection is based on the strongest evidence
- Acute Exacerbation of COPD
- Acute Respiratory Failure with PH ≤7.35, PaC02 >45mmHg
- Patients with PH <7.25 should still be considered to avoid ETI (endotracheal intubation) these patients are at greater risk for failure if not monitored closely
- NIV (BiPAP) is NOT recommended for acute exacerbation of COPD who present with hypercapnia without acidosis
  - Target should be a lower oxygen saturation (88-92%) as Hyperoxia in this patient population can be the catalyst for acidosis and elevation of PC02 above the patient's "normal" range

22

MOU1 Microsoft Office User, 8/22/2023

BIPAP TREATMENT

- Work of breathing in these patients is directly related to the degree of obstruction, air trapping, and the amount of time of accessory muscle usage from onset of exacerbation
  - Decreasing work of breathing
  - Increasing Tidal Volumes and decreasing respiratory rate while correcting hypercapnia and "normalizing" pH
  - Patient comfort and synchrony
  - Use of anti-anxiety medications should not be discouraged provided they do not suppress respiration
  - Patients must be closely monitored for signs of improvement or deterioration
  - Aggressive alternative therapeutics must be also considered if signs of infection are present
    - For example: Solumedrol, bronchodilators, antibiotics

23

BIPAP PARAMETERS

- Mode is Chosen, Where Do We Start?
  - Typical BEGINNING pressures 8/4, 10/5, 12/6 (minimum Delta P is 4cmH20)
  - Avoid hyperoxia, especially in exacerbations that lack hypoxemia
  - EPAP levels are titrated to assist with airway patency elimination of trapped air, not necessarily oxygenation
  - IPAP levels are titrated to adequate (lung protective) tidal volumes, decreasing respiratory rate and work of breathing while maintaining adequate minute ventilation for correction of PC02
  - Blanket orders for these patients are not appropriate and titration must be performed on every patient based on need/response to therapy
  - If a patient does not appear significantly improved after initiation and titration of NIV, assess need for pharmacologic therapy, further adjustments in settings, address synchrony, or anxiety.
  - If patient condition does not improve or continues to decline, do not delay in initiation of IMV

24

BIPAP PARAMETERS

- Patients are closely monitored
- Mask fit, comfort and patient synchrony are crucial for success
- Respiratory rate and inspiratory time are "settings" but only back up rates – They are not "synchronized" to spontaneous breaths, not guaranteed and are only active if the patients spontaneous breaths taken by the patient fall below set parameters.
  - For example:
    - Set rate is 8, the patient's spontaneous rate is 10 – ZERO breaths are "delivered by the ventilator
    - Set rate is 8 patient's spontaneous rate is now 4, there are 4 additional "breaths" delivered by the ventilator

25

BIPAP PARAMETERS

- If patient is not improving within the first 1-3 hours or becomes less responsive, initiate IMV (invasive mechanical ventilation
- Titrations may include changes in EPAP for oxygenation issues or attempts to open airways
- Tidal volume titrations are the resultant of IPAP increases (Delta P)
  - In the event of EPAP increases, IPAP needs to be increased in the same increments if Delta P is adequate (Decreasing the Delta P would result in a decease of Tidal Volume)

26

AUTOMATED (CLOSED LOOP) MODES

- ****AVAPS = Average volume assured pressure support (Phillips V60 ventilator)**
- A positive pressure (dual) mode with a volume target
- Pressure limits are set (high and low limits) with an average tidal volume "target"
- Primary use ALS, neuromuscular patients, patients with normal/near normal lung compliance, CHRONIC COPD PATIENTS (compensated blood gases)
- Cautionary usage in patients with low lung compliance. Patients with decrease compliance where upper pressure limitations have been reached, LOSE tidal volume that can no longer be guaranteed
- Other examples of Automated (Closed Loop Ventilation) include:
- Proportional Assist, NAVA, MCC, Intellivent ASV, Smart Care
- ****There is no supporting evidence for the use of automated/closed loop ventilation in acute NIV- Philips warns to not use AVAPS for acute exacerbation of COPD**

27

WEANING BIPAP

- Caution! Do not allow patients to **over ventilate** or **over correct blood gases!**
  - COPD patients present with compensated respiratory acidosis (elevated PC02 and HC03 with normal PH)
  - When overcorrected COPD patients may have apnea episodes or drop their spontaneous rate (less triggering)
  - Assess patient to make sure they remain rousable, if so- wean settings or trial off. If not, prepare for intubation and IMV

28

WEANING BIPAP

- Improvement in ventilation
- Improvement in breath sounds (increase in aeration, may or may not hear more pronounced wheezing, but will hear improved airflow)
- Improvement in blood gases
- Improvement in use of accessory muscles
- If tidal volumes have increased, IPAP and EPAP pressures need to be titrated down or patient given a trial off
  - If patient still requires BiPAP (needs more time) titrate pressures down and continue therapy, monitoring frequently

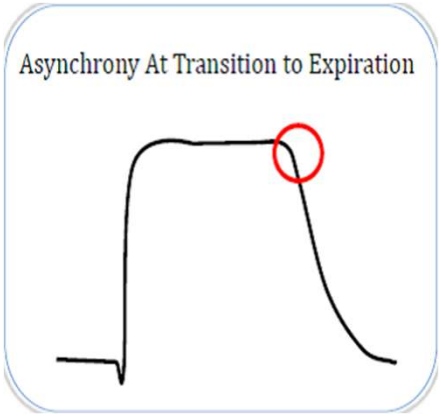
29

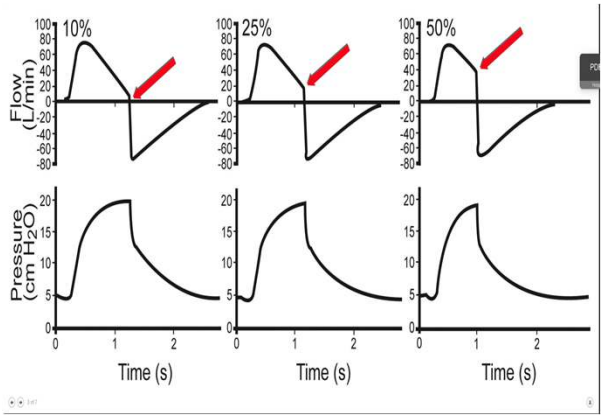
SYNCHRONY ADJUNCTS

- **Rise time/slope** – can be adjusted to patient comfort
  - How fast or slow pressure is achieved during the patient's spontaneous breath
- **E Cycle, % Inspiratory Flow Termination, Cycle Off**
  - Ventilators are preset to terminate inspiratory flow at 75% (25% remaining) of PIF (peak inspiratory flow) can be adjusted based on each patient
- Easily identified in Pressure/Time Scalars as a "peak" and pressure overshoot at the beginning of exhalation.
- V60 ventilator has **C flex** option for CPAP
  - A deceleration of flow and slight "dip" in CPAP pressure of 1, 2 or 3cmH20 during exhalation
- **Ramp option**
  - Should not be used in acute NIV, reserved for slow, timed, "ramp" to pressure while a chronic NIV patient falls asleep (in some equipment ramp times are up to 45 minutes

30

E CYCLE, % INSPIRATORY FLOW TERMINATION, CYCLE OFF

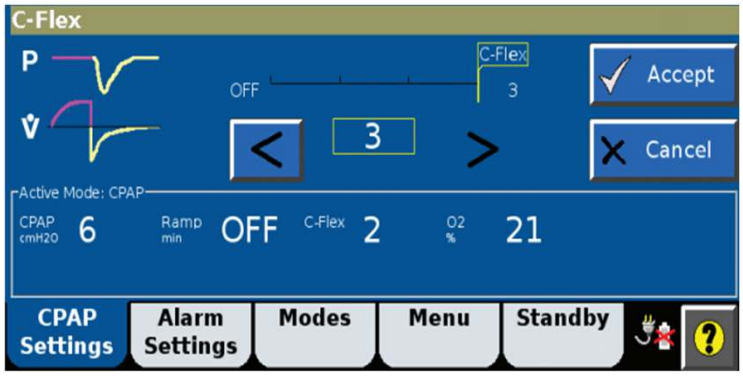




Gentile, M. A. (2011). Cycling of the Mechanical Ventilator Breath. *Respiratory Care*, *56*(1), 52–60. https://doi.org/10.4187/respcare.01088

31

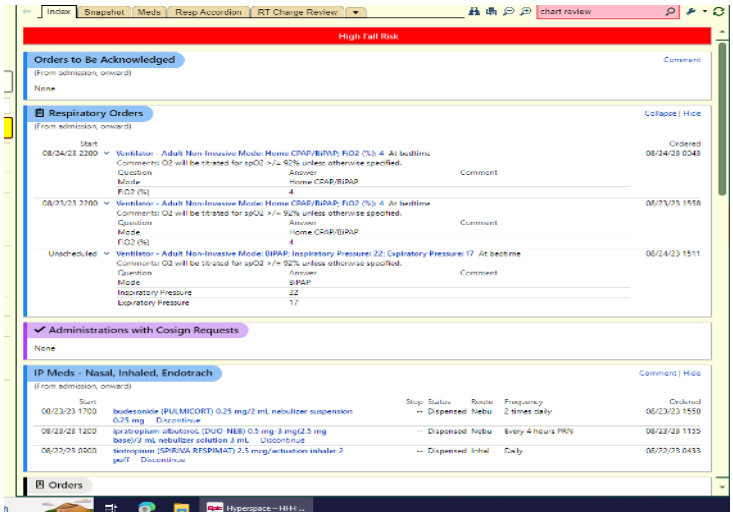
CFLEX - CPAP PHILIPS V60 VENTILATOR



https://philipsproductcontent.blob.core.windows.net/assets/20181016/380db64b908f4c508546a97b014e98c0.pdf

32

BRIEF CHRONIC (OR ACUTE) NIV MENTION



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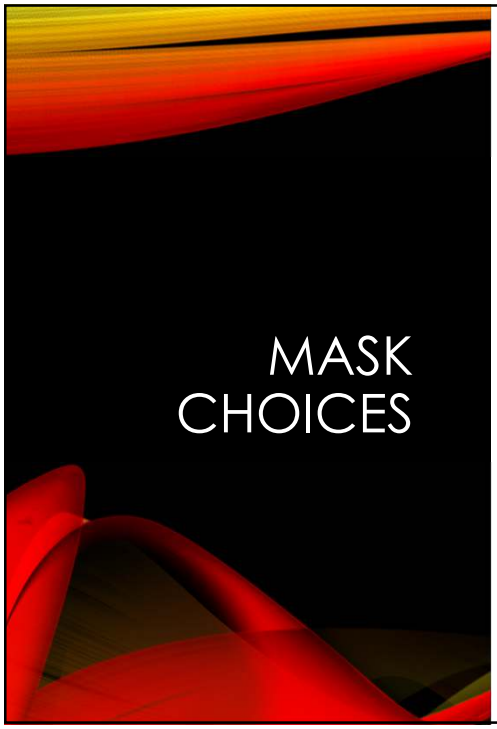


MASK CHOICES

When treating patients for acute hypoxic or hypercapnic failure you should only use full face or total face masks.

The goal is to have a minimal leak and to maintain both pressures and volume

Each manufacturer has different sizing charts and proper mask "fit" should be part of departmental orientation and instructed for each type of mask available

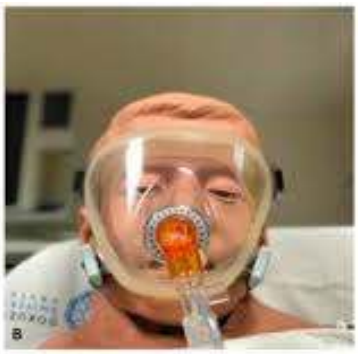
Nasal masks or nasal pillows allow to much air to escape through the patient's mouth, even when chin straps are used. This leakage makes tidal volume/minute ventilation too variable

If the patient cannot tolerate a full-face mask, your next best option it to attempt to possibly try a heated high flow nasal cannula

If the patient is going to be on NIV for a length of time, skin integrity should be carefully monitored

34

FULL AND TOTAL FACE MASKS



35

NASAL OPTIONS

36

USE OF HEATED HIGH FLOW NASAL CANNULAS

- Specific FI02
- Heated humidification
- Flows up to 60 L/M
- Improved mucocilliary movement
- PC02 clearance (dead space ventilation)
- Generation of PEEP (small amounts not sustainable, but useful)
- Considerable evidence comparing HHFNC to NIV – more RCT are needed

37

DON'T FORGET THE SKIN!

- Preventing pressure injuries (The why)
- In July 2016 (updated #/2022) the Joint Commission published a "Quick Safety" advisory. In part stating, " Pressure injuries is a marker of poor overall prognosis and may contribute to premature mortality in some patients. In addition, the development of stage 3 and 4 pressure injuries is considered by The Joint Commission as a patient safety event that could be a sentinel event."
- In 2008 CMS announced it will not pay for additional costs incurred for hospital acquired injuries. They determined they are preventable using evidenced based (nursing)practice.

quick-safety-25-update-3-21-22.pdf (jointcommission.org)accessed June 13, 2022

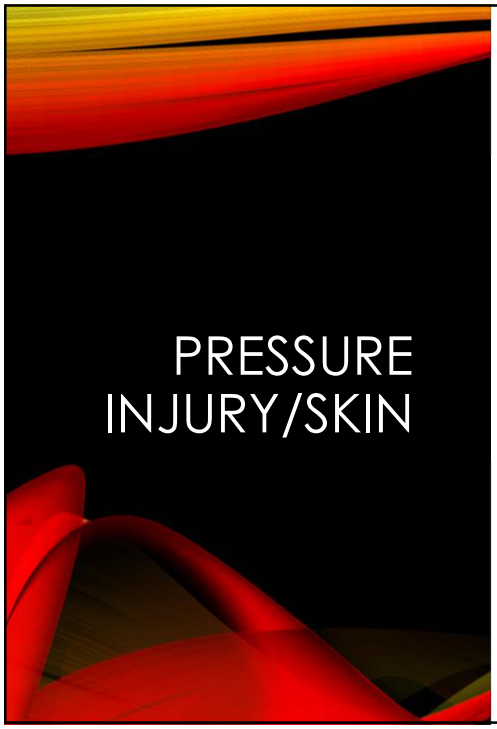
38

PRESSURE INJURY/SKIN

- In 2019, the European Pressure Ulcer Advisory Panel (EPUAP), the National Pressure Injury Advisory Panel (NPIAP) and the Pan Pacific Pressure Injury Alliance (PPPIA) published the International Guideline (Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline)
- This guideline provides:
  - Evidence based recommendations, good practice statements and implementation considerations for P.I prevention and treatment
  - Recommendation to measuring and reporting pressure injury rates
  - It applies to ALL clinical settings including acute care

quick-safety-25-update-3-21-22.pdf (jointcommission.org)accessed June 13, 2022

39



- Defining Pressure Injury:

A pressure injury is localized damage to the skin and or 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 also may be affected by microclimate, nutrition, perfusion, co-morbidities, and condition of the soft tissue.

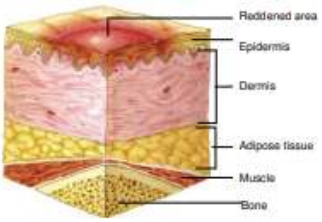
quick-safety-25-update-3-21-22.pdf (jointcommission.org)accessed June 13, 2022

40

STAGES OF PRESSURE INJURY

- Staging Guide_092208.pub

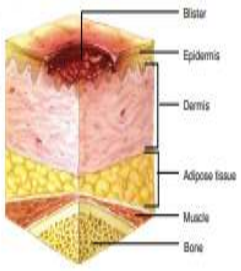
STAGE I
Intact skin with non-blanchable redness of a localized area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area. This area may be painful, firm, soft, warmer, or cooler as compared to adjacent tissue. Stage I may be difficult to detect in individuals with dark skin tones. May indicate "at risk" persons (a heralding sign of risk).



41

STAGES OF PRESSURE INJURY

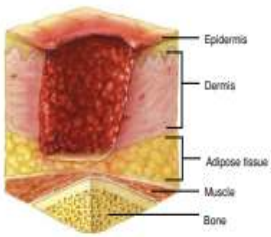
STAGE II
Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled blister. Presents as a shiny or dry shallow ulcer without slough or bruising (bruising indicates suspected deep tissue injury). This stage should not be used to describe skin tears, tape burns, perineal dermatitis, maceration, or excoriation.



42

STAGES OF PRESSURE INJURY

STAGE III
Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon, or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling. The depth of a stage III pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput, and malleolus do not have subcutaneous tissue and stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep stage III pressure ulcers. Bone/tendon is not visible or directly palpable.

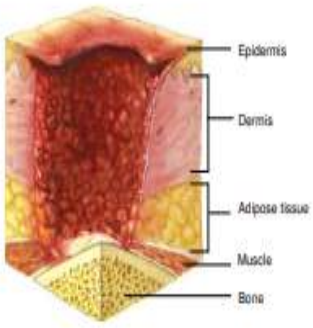


Web accessed Dot Gov. Center For Medicare Quality Improvement

43

STAGES OF PRESSURE INJURY

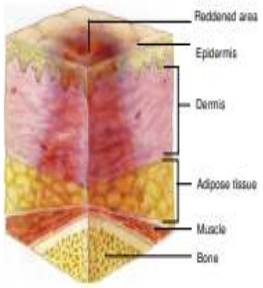
STAGE IV
Full thickness tissue loss with exposed bone, tendon, or muscle. Slough or eschar may be present on some parts of the wound bed. Often includes undermining and tunneling. The depth of a stage IV pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput, and malleolus do not have subcutaneous tissue and these ulcers can be shallow. Stage IV ulcers can extend into muscle and/or supporting structures (e.g., fascia, tendon, or joint capsule) making osteomyelitis possible. Exposed bone/ tendon is visible or directly palpable.



44

STAGES OF PRESSURE INJURY

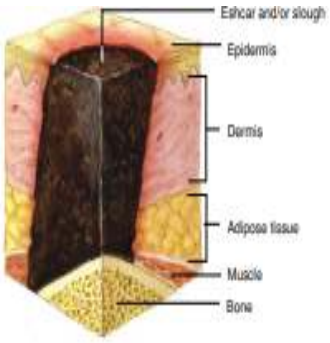
DEEP TISSUE INJURY
Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer, or cooler as compared to adjacent tissue. Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Evolution may be rapid exposing additional layers of tissue even with optimal treatment.



45

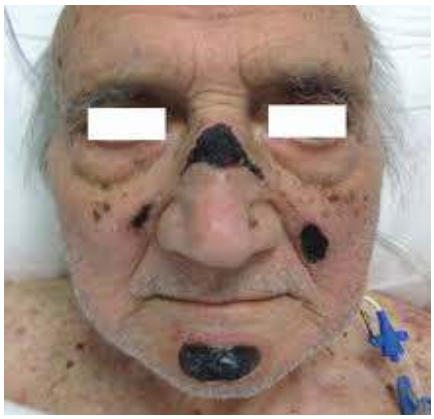
STAGES OF PRESSURE INJURY

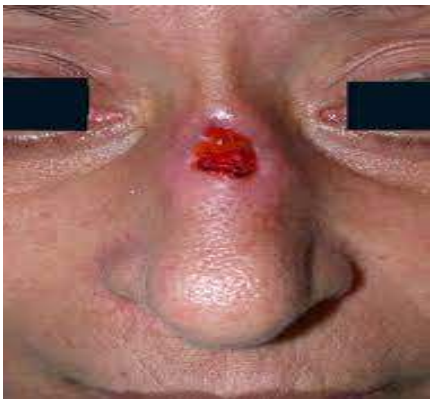
UNSTAGEABLE
Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed. Until enough slough and/or eschar is removed to expose the base of the wound, the true depth, and therefore stage, cannot be determined. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as "the body's natural (biological) cover" and should not be removed.



46

WE SHOULD NEVER SEE THIS





47

PRESSURE INJURY AVOIDANCE

- Know if your patient is at higher risk for development of pressure injuries- utilize assessment tools available
- Proper mask selection and SIZE (do not over tighten straps)
- Rotate devices – Mask to Heated High Flow (if able)
- Offer short breaks
- Examine skin frequently, injury can occur quickly
- At the first signs of injury, notify, document and TREAT

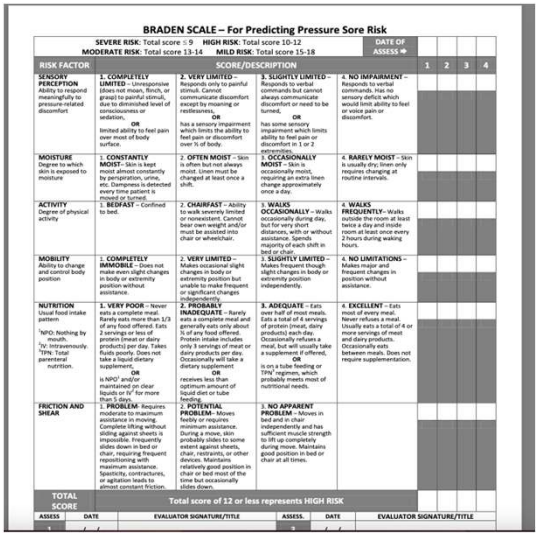
48

PRESSURE INJURY PREVENTION POINTS

- Risk Assessments :The three most widely used scales are the Braden Scale, the Norton Scale, and the Waterlow Scale.
- Skin Care: Inspect, assess pressure points, especially under the device, clean skin and use protective barriers
- Nutrition: use a valid tool to assess risk for malnutrition-consult dietitian or nutritionist.
- Positioning: Device rotation or breaks, watch position while sleeping, use pressure relieving devices when able
- Monitor, Training and Leadership Support: Train staff, monitor prevalence and incidence of injury, ensure leadership support, oversight and allocation of adequate resources

49

BRADEN SCALE



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	**1. COMPLETELY LIMITED** – Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation, **OR** limited ability to feel pain over most of body surface.	**2. VERY LIMITED** – Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, **OR** has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	**3. SLIGHTLY LIMITED** – Responds to verbal commands but cannot always communicate discomfort or need to be turned, **OR** has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	**4. NO IMPAIRMENT** – Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
MOISTURE Degree to which skin is exposed to moisture	**1. CONSTANTLY MOIST**– Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	**2. OFTEN MOIST** – Skin is often but not always moist. Linen must be changed at least once a shift.	**3. OCCASIONALLY MOIST** – Skin is occasionally moist, requiring an extra linen change approximately once a day.	**4. RARELY MOIST** – Skin is usually dry; linen only requires changing at routine intervals.				
ACTIVITY Degree of physical activity	**1. BEDFAST** – Confined to bed.	**2. CHAIRFAST** – Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	**3. WALKS OCCASIONALLY** – Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	**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	**1. PROBLEM**– Requires moderate to maximum assistance to move. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	**2. POTENTIAL PROBLEM** – Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the 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	/ /	

50

Tri-Anim Protecta gel barrier

PREVENTATIVE BARRIER DEVICES

51

Allevyn gentle foam

PREVENTATIVE BARRIER DEVICES

52

WE HAVE AN INJURY, NOW WHAT?

- If you assess your patient and note a stage 1 injury or worse
  - Notify the RN and Provider
  - Document discovery according to your institutions policy
  - TREAT EARLY
  - Determine next steps, continue current therapy or other?
  - If patient is to remain on NIPPV rotate devices, assess more frequently and communicate! Make sure oncoming shift and all caregivers are aware of the injury and treatment plan
  - If Pressure injury increases in staging – notify wound care team.

53

CONCLUSION

- There is more successes than failures with NIV in those patients with strong evidence conditions (SEC's)
- There are thousands of research articles that speak to successes and failures along with tools to assist you in predicting both
- We have so many options for comfort (ventilator adjuncts) mask options, and protective barriers in order to avoid NIV failure and Pressure Injury
- Remember "lack of knowledge of the mode" is THE most avoidable risk factor for our patients
- Once a potential pressure injury is discovered, early intervention is critical

54

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55

QUESTIONS?

56