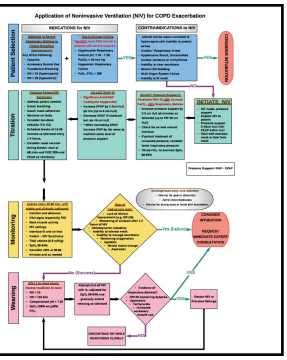
Algorithm of Non-Invasive Ventilation for COPD Exacerbation



1

Patient Selection

INDICATIONS for NIV

Moderate to Severe Respiratory Distress in Patient Breathing Spontaneously

Any of the Following:

- Dyspnea
- Accessory Muscle Use
- Paradoxical Breathing
- RR > 24 (hypercapnic)
- RR > 30 (hypoxemic)

+

- **Gas Exchange Criteria**

**Do NOT await ABG results in patients with severe dyspnea

- Hypercapnic Respiratory Failure/ pH: 7.10 - 7.35; $PaCO_2$ > 45 mm Hg
- Hypoxemic Respiratory Failure
- PaO_2 /FIO_2 < 300

2

CONTRAINDICATIONS to NIV

- Altered mental status unrelated to hypercapnia with inability to protect airway
- Cardiac / Respiratory Arrest
- Hypotensive Shock, Uncontrolled Cardiac Ischemia or Arrhythmias
- Inability to clear secretions
- Severe UGI bleeding
- Multi-Organ System Failure
- Inability to fit mask

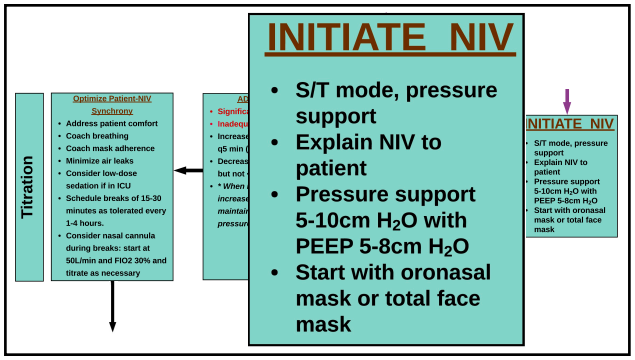
→ Consider Intubation

3

Initiating NIV

Technical Considerations

4



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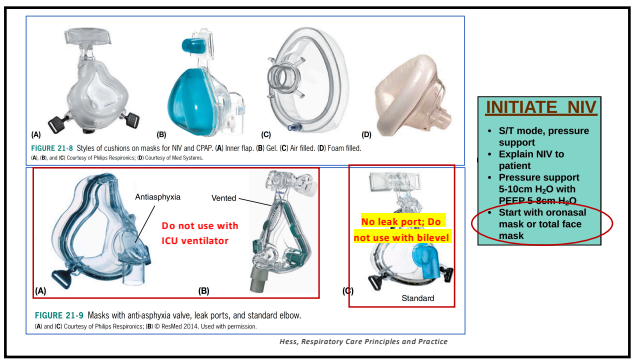

6

The Ventilator for NIV: Leak Compensation

- Bilevel
  - PSV/PCV
  - Passive circuit
- Intermediate
  - PSV, PCV, VCV
  - Active or passive circuit
- Critical care
  - Dual limb circuit
  - Many modes
  - NIV + HFNC + invasive

7

IPAP, EPAP, and the Patient Perspective

- IPAP: peak inspiratory pressure; patient feels a higher pressure in the mask.
- EPAP: expiratory pressure (PEEP); patient feels the pressure drop, but there is always pressure in the mask.
- Pressure support: difference between IPAP and EPAP; patient perceives unloading of respiratory muscle effort (easier to breathe) and deeper breath (tidal volume augmentation).
- CPAP: constant pressure in the mask; used primarily for OSA; some patients have OSA + COPD overlap and might use CPAP for OSA at home, but CPAP not appropriate for exacerbation.

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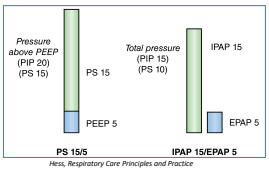
Ventilators for NIV (Bilevel Devices)

- Ventilators for NIV are typically pressure support devices with leak compensation.

- IPAP = PIP
- EPAP = PEEP
- PS = IPAP – EPAP
- Back-up rate for S/T



Hess, Respiratory Care Principles and Practice

INITIATE NIV

- S/T mode, pressure support
- Explain NIV to patient
- Pressure support 5-10cm H_2O with PEEP 5-8cm H_2O
- Start with nonasal mask or full face mask

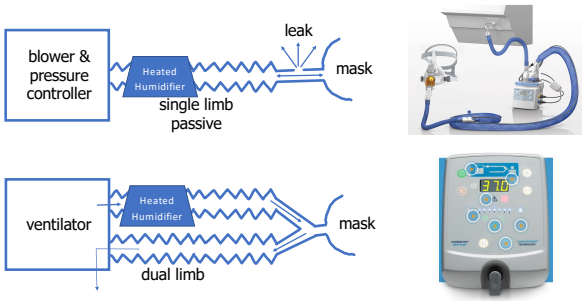
IPAP: 10 – 15 cm H_2O
EPAP: 5 – 8 cm H_2O

Backup rate: 10/min for S/T

9

What About Humidification?

10



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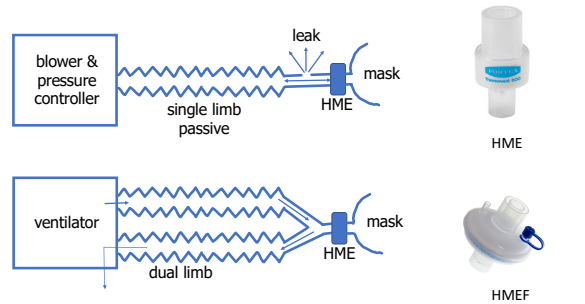

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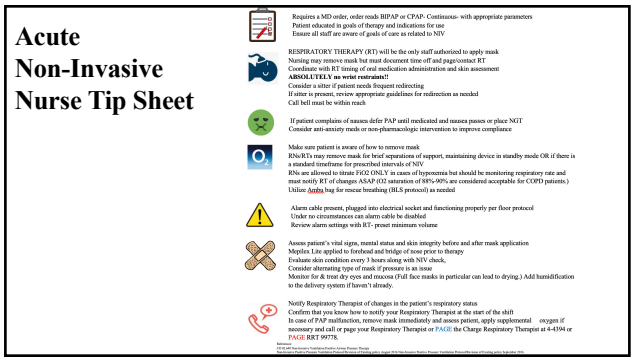

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Skin Breakdown

- Correct fit mask
- Adjust headgear; forehead spacer
- Different interface: total face mask, hybrid, helmet
- Rotate interfaces
- Remove mask for short periods if possible; rotate with HFNC
- Foam Preventive Dressing (Allevyn, Mepilex)

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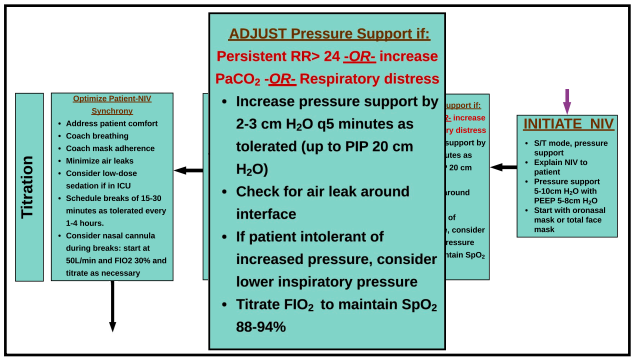

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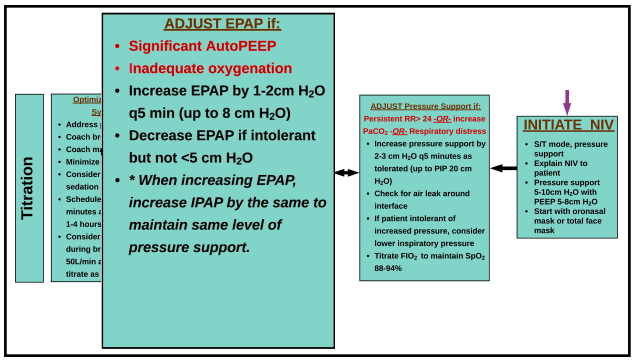
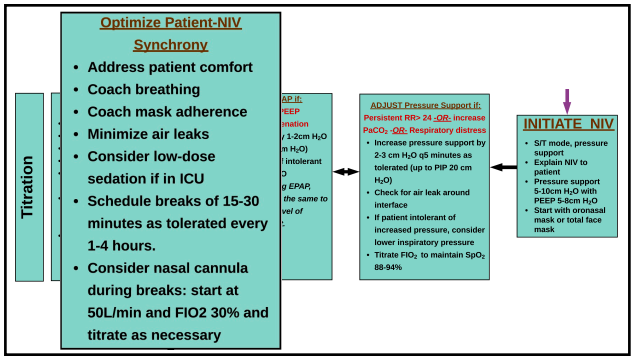

Titration
ADJUST EPAP if:
Significant AutoPEEP
Inadequate oxygenation
Increase EPAP by 1-2cm H2O q5 min (up to 8 cm H2O)
Decrease EPAP if intolerant but not <5 cm H2O
* When increasing EPAP, increase IPAP by the same to maintain same level of pressure support.
ADJUST Pressure Support if:
Persistent RR> 24 -OR- increase PaCO2 -OR- Respiratory distress
Increase pressure support by 2-3 cm H2O q5 minutes as tolerated (up to PIP 20 cm H2O)
Check for air leak around interface
If patient intolerant of increased pressure, consider lower inspiratory pressure
Titrate FIO2 to maintain SpO2 88-94%
INITIATE NIV
S/T mode, pressure support
Explain NIV to patient
Pressure support 5-10cm H2O with PEEP 5-8cm H2O
Start with oronasal mask or total face mask

16


Titration
Optimize Patient-NIV Synchrony
Address patient comfort
Coach breathing
Coach mask adherence
Minimize air leaks
Consider low-dose sedation if in ICU
Schedule breaks of 15-30 minutes as tolerated every 1-4 hours.
Consider nasal cannula during breaks: start at 50L/min and FIO2 30% and titrate as necessary
ADJUST Pressure Support if:
Persistent RR> 24 -OR- increase PaCO2 -OR- Respiratory distress
Increase pressure support by 2-3 cm H2O q5 minutes as tolerated (up to PIP 20 cm H2O)
Check for air leak around interface
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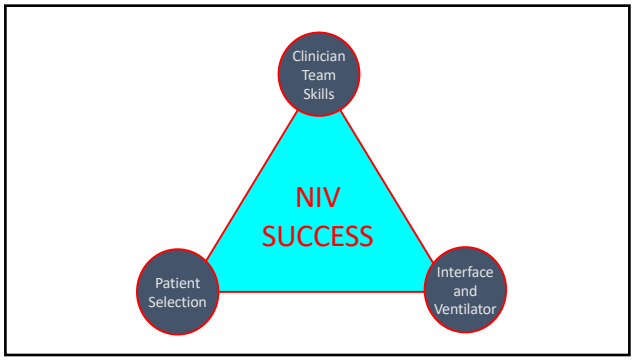
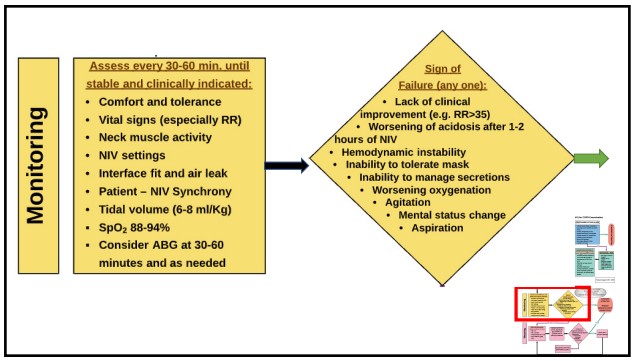

Clinician Team Skills
NIV SUCCESS
Patient Selection
Interface and Ventilator

18


Monitoring
Assess every 30-60 min. until stable and clinically indicated:
• Comfort and tolerance
• Vital signs (especially RR)
• Neck muscle activity
• NIV settings
• Interface fit and air leak
• Patient – NIV Synchrony
• Tidal volume (6-8 ml/Kg)
• SpO2 88-94%
• Consider ABG at 30-60 minutes and as needed
Sign of Failure (any one):
• Lack of clinical improvement (e.g. RR>35)
• Worsening of acidosis after 1-2 hours of NIV
• Hemodynamic instability
• Inability to tolerate mask
• Inability to manage secretions
• Worsening oxygenation
• Agitation
• Mental status change
• Aspiration

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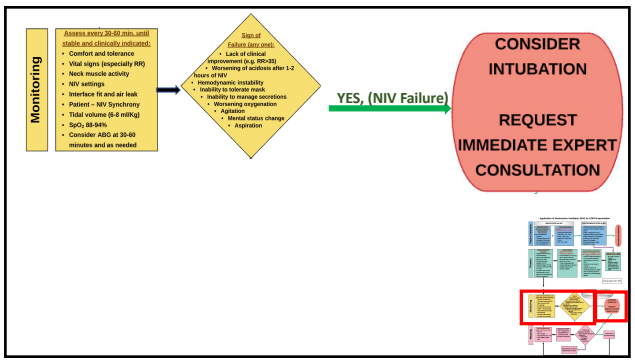
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• Worsening oxygenation
• Agitation
• Mental status change
• Aspiration
YES, (NIV Failure)
CONSIDER INTUBATION
REQUEST IMMEDIATE EXPERT CONSULTATION

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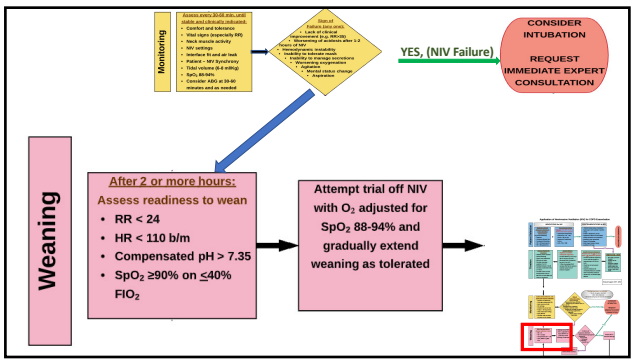
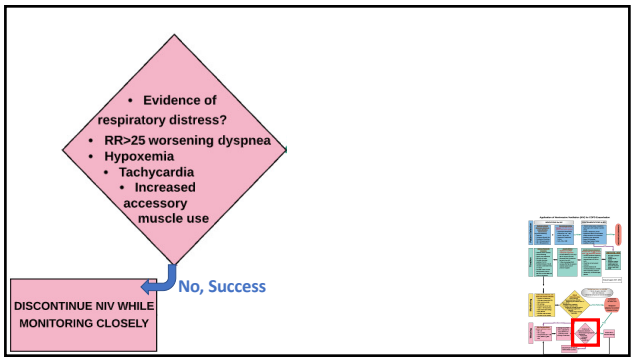

Monitoring
YES, (NIV Failure)
CONSIDER INTUBATION
REQUEST IMMEDIATE EXPERT CONSULTATION
Weaning
After 2 or more hours:
Assess readiness to wean
• RR < 24
• HR < 110 b/m
• Compensated pH > 7.35
• SpO2 ≥90% on ≤40% FIO2
Attempt trial off NIV with O2 adjusted for SpO2 88-94% and gradually extend weaning as tolerated

21


• Evidence of respiratory distress?
• RR>25 worsening dyspnea
• Hypoxemia
• Tachycardia
• Increased accessory muscle use
No, Success
DISCONTINUE NIV WHILE MONITORING CLOSELY

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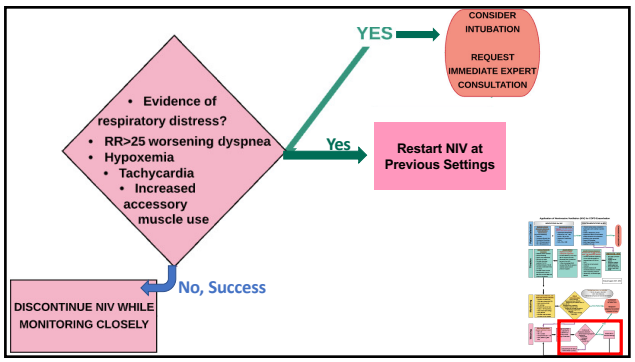
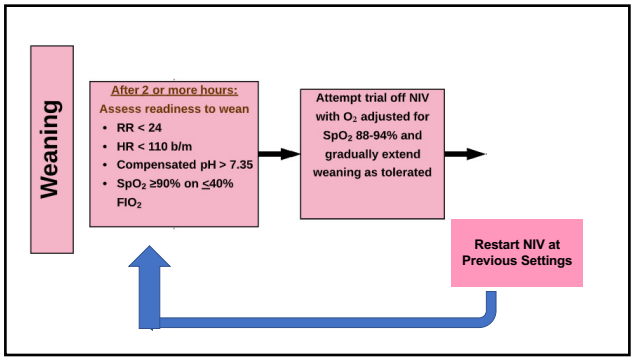

YES
CONSIDER INTUBATION
REQUEST IMMEDIATE EXPERT CONSULTATION
• Evidence of respiratory distress?
• RR>25 worsening dyspnea
• Hypoxemia
• Tachycardia
• Increased accessory muscle use
Yes
Restart NIV at Previous Settings
No, Success
DISCONTINUE NIV WHILE MONITORING CLOSELY

23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• SpO_2 ≥90% on ≤40% FIO_2
Attempt trial off NIV with O_2 adjusted for SpO_2 88-94% and gradually extend weaning as tolerated
Restart NIV at Previous Settings

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