

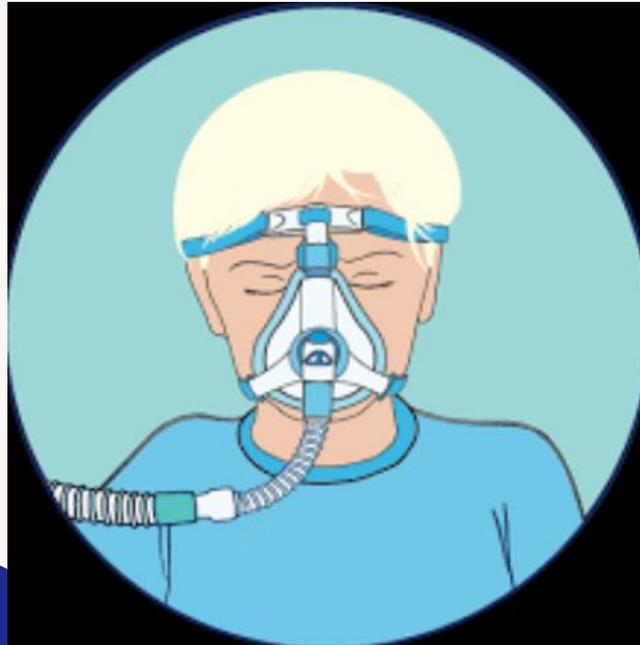
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Kerman University
of Medical Sciences

NONINVASIVE VENTILATION



Mohsen Shafiepour

Kerman University of Medical Sciences | KMU · Department of Internal Medicine
Assistant Professor of Pulmonary Diseases

شما هم دعوتید

سمینار

اختلالات خواب تهویه غیرتهاجمی

دوروزه - کرمان

بیمارستان افضلی پور
سالن کنفرانس ها

03/9/21
03/9/22

08:00 AM

 دکتر رضا رهنیزی کاربردهای NIV در ICU	 دکتر اعظم غلامی کاربردهای NIV در اطفال	 دکتر امیرآفرین مهرزاد کاربردهای NIV در جراحی	 دکتر سیدمهدی هاشمی کاربردهای NIV در نارسای حاد تنفسی	 دکتر محسن شفیع پور مقدمات، کاربردها و کنترالندیکاسیون های NIV
 دکتر محمدامین لطفی اکسیژن درمانی	 دکتر فرزانه جهانبخش تست خواب و تهراسیون	 دکتر امیر الهی ضیاءالدینی کاربردهای NIV در بیماری های نورواماسکولار قفسه سینه	 دکتر آیه همس الینیس جراحی راه های هوایی و ORAL APPLIANCE در بیماران آپنه خواب	 دکتر احمد شفاهی کاربردهای NIV در نارسایی مزمن تنفسی

با حمایت:

نفسی درمان

اولین فروشگاه تخصصی و فوق تخصصی تنفسی در استان کرمان

احیا گستر طب فر آیند

والا درمان امیر کبیر

Nafas Darman



شما هم دعوتید

سمینار

اختلالات خواب تهویه غیرتهاجمی

کرمان

دوروزه

دارای ۸ امتیاز بازآموزی

دبیر علمی:
دکتر محسن شفیع پور

با حمایت:
نفس درمان

اولین فروشگاه تخصصی و فوق تخصصی تنفسی در کرمان

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جنب کتابخانه، سالن سمینار ها



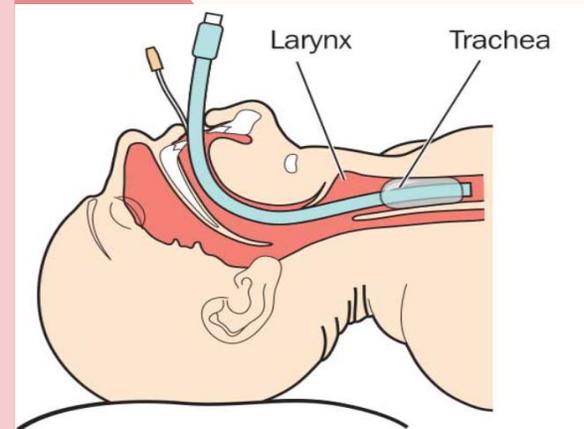
Nafas Darman

nafasdarman.com

- Review of Basics
- Definition
- Goals of NIV
- Types
- Advantages and Disadvantages
- Indications and Contraindications
- Interface
- Modes of NIV
- Guidelines for Initiation and Termination
- Complications
- Evidence for use
- Conclusion

WHAT IS NON-INVASIVE VENTILATION (NIV)?

Non-invasive ventilation (NIV) is the **delivery of respiratory support to a patient using an external interface** (mask or helmet). Unlike **invasive mechanical ventilation (IMV)**, which involves the insertion of an artificial airway (endotracheal tube or [tracheostomy](#)), NIV does **not** interfere with the patient's upper airways and preserves their ability to speak, cough and swallow



REVIEW OF BASICS

- Respiratory failure is a syndrome where the respiratory system fails in one or both of its gas exchange functions:
 - Oxygen uptake
 - Carbon dioxide elimination
- Respiratory failure may be acute, chronic, or acute on chronic
- Derangements in ABG and acid-base status
- Acute – life threatening
- Chronic – less dramatic
- Hypoxemia and/or hypercapnea
- Type 1 – Hypoxemia, $\text{PaO}_2 < 60 \text{ mmHg}$
- Type 2– Hypoxemia and Hypercapnia

CAUSES OF RESPIRATORY FAILURE

- Alveolar filling processes
 - Pulmonary vascular disease
- Diseases causing airways obstruction (central or distal)
 - Hypoventilation: decreased central drive
- Hypoventilation: peripheral nervous system/respiratory muscle dysfunction
 - Hypoventilation: chest wall and pleural disease
 - Increased ventilatory demand

Hypoxemic Respiratory Failure	Hypercapnic Respiratory Failure
<p>Known as: Type I ARF, Lung Failure, Oxygenation Failure, Respiratory Insufficiency</p>	<p>Known as: Type II ARF, Pump Failure, Ventilatory Failure</p>
<p>Definition: The failure of lungs and heart to provide adequate O₂ to meet metabolic needs</p>	<p>Definition: The failure of the lungs to eliminate adequate CO₂</p>
<p>Criteria: PaO₂ < 60 mmHg on FiO₂ ≥ .50 or PaO₂ < 40 mmHg on any FiO₂ SaO₂ < 90</p>	<p>Criteria: Acute ↑ in PaCO₂ > 50 mmHg or Acutely above normal baseline in COPD with concurrent ↓ in pH < 7.30</p>
<p>Basic Causes: R-L shunt V/Q mismatch Alveolar hypoventilation Diffusion defect Inadequate FIO₂</p>	<p>Basic Causes: Pump failure (drive, muscles, WOB) ↑ CO₂ production R-L shunt ↑ Deadspace</p>

Goals of NIV

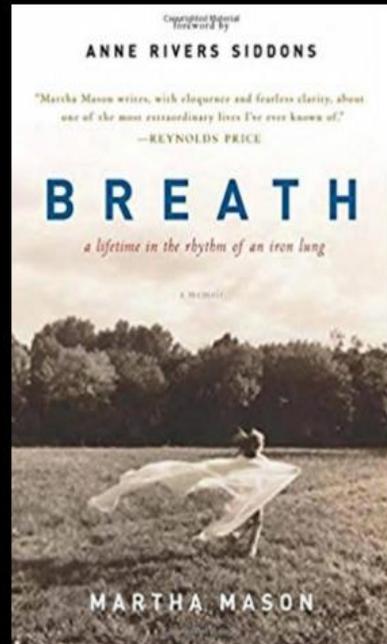
- Provide time for the cause of respiratory failure to resolve and improve gas exchange
 - Overcome auto-PEEP
- Unload the respiratory muscle
- Decrease dyspnea
- Avoid Endotracheal Intubation
- Avoid complications

TYPES OF NIV

- **Negative Pressure NIV**
 - Main means of NIV during the early 1900's
 - Extensively used during the polio epidemics
 - Tank ventilator “iron lung”
 - Cuirass, Jacket ventilator, Hayek oscillator
- **Positive Pressure NIV**
 - Positive pressure delivered through mask
 - CPAP
 - BIPAP
 - AVAPS
 - ASV

IRON LUNG

- New York Times May 2009
- “Martha Mason, who wrote a book about her decades in an iron lung, dies at age 71.”



HOW DOES NIV WORK?

- Reduction in inspiratory muscle work and avoidance of respiratory muscle fatigue
- Augments tidal volume
- Improves compliance by reversing microatelectasis
- Overcome intrinsic PEEP
- Enhanced cardiovascular function (afterload reduction)
- Stent the airway
- Reduce CO₂ production

NIV FOR HYPOXEMIC RESPIRATORY FAILURE

- Increased FIO₂
- PEEP
 - Alveolar recruitment
 - Increased V/Q
 - Decreased Shunt
 - Increased FRC
 - Decreased RR and WOB



NIV FOR HYPERCAPNIC RESPIRATORY FAILURE

- Offsets auto-PEEP
- Reduce airway resistance
- Improve VT, VE, PaCO₂

(Minute ventilation)

$$VE = VT \times RR$$

- Correction of gas exchange
 - Improve lung mechanics
- Reduce resistive work imposed by invasive ventilation
- Ventilates effectively with lower pressures
- Flexibility in initiation/termination
- Intermittent application
- Patient comfort
- Correct mental status
- Preserves speech/swallowing/expectoration
- Reduces need for nasogastric tubes
 - Reduce need for sedation
- Avoids complications of ETT
 - Trauma/injury, aspiration
- Avoids complications of invasive ventilation
 - Infection-pneumonia, sepsis, sinusitis ;GI bleed; DVT
- Less cost
- Decrease mortality associated with respiratory failure
 - Assist in end of life care



ADVANTAGES

- **SYSTEM**
- **SLOWER CORRECTION OF GAS EXCHANGE ABNORMALITIES**
- **TIME COMMITMENT/ATTENTION**
- **GASTRIC DISTENTION**
- **MASK**
- **LEAKS**
- **SKIN NECROSIS/RASH**
- **EYE/EAR IRRITATION**
- **SINUS PRESSURE**
- **AIRWAY**
- **ASPIRATION**
- **LIMITED SECRETION CLEARANCE**



DISADVANTAGES

Contraindications to noninvasive ventilation

Absolute

The need for emergent intubation (eg, cardiac or respiratory arrest, severe respiratory distress, unstable cardiac arrhythmia)

Relative

Nonrespiratory organ failure that is acutely life-threatening

Severe encephalopathy (eg, GCS <10)

Severe upper gastrointestinal bleeding

Hemodynamic instability

Facial or neurological surgery, trauma, or deformity

Significant airway obstruction (eg, laryngeal mass or tracheal tumor)

Inability to cooperate, protect airway, or clear secretions (eg, patients at high risk of aspiration)

Anticipated prolonged duration of mechanical ventilation (eg, ≥ 4 to 7 days)

Recent esophageal or gastric anastomosis*

Multiple contraindications

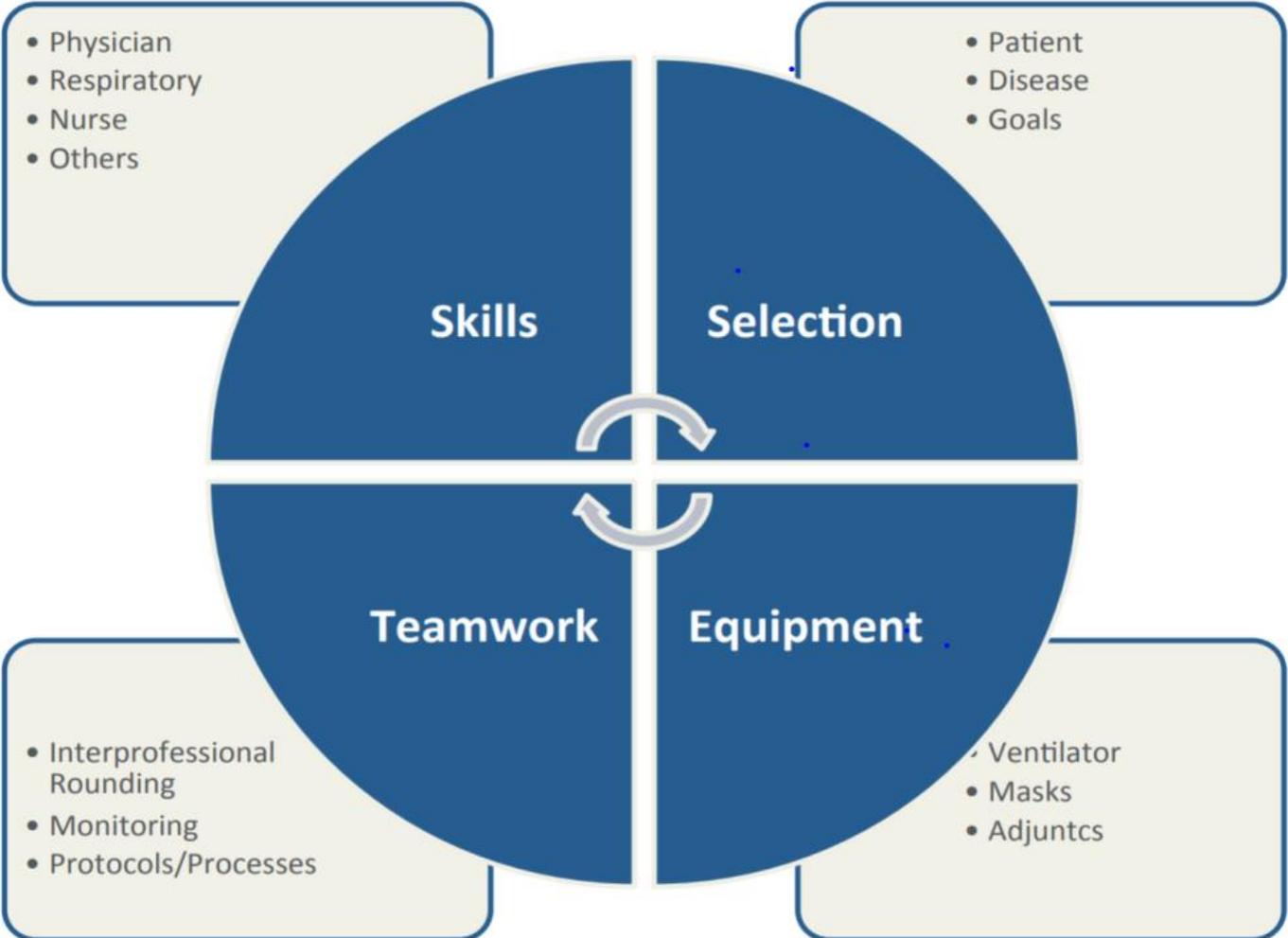
Insufficient staffing support

CANDIDATES FOR NIV

1. Clinical judgement supersedes
 2. • Cooperative patient
 3. • Dyspnea/increased WOB
 4. • Hypoxemia and/or hypercapnia
 5. • Respiratory acidosis
 6. • Clinical Conditions
 7. • COPD
 8. • stable
 9. • acute exacerbation
 10. • Cardiogenic Pulmonary edema
 11. • Immunosuppressed
 12. • DNR(Do-Not-Resuscitate)/DNI(Do Not Intubate)
- Selected patients:
 - COPD + Pneumonia
 - Facilitate weaning
 - Asthma
 - OSA/OHS
 - Cor pulmonale
 - ARDS
 - Neuromuscular disease
 - Restrictive thoracic disorders
 - Cystic Fibrosis
 - Post extubation
 - Post op respiratory failure

MULTIDISCIPLINARY APPROACH

MU



PATIENT SELECTION

- **Step 1**

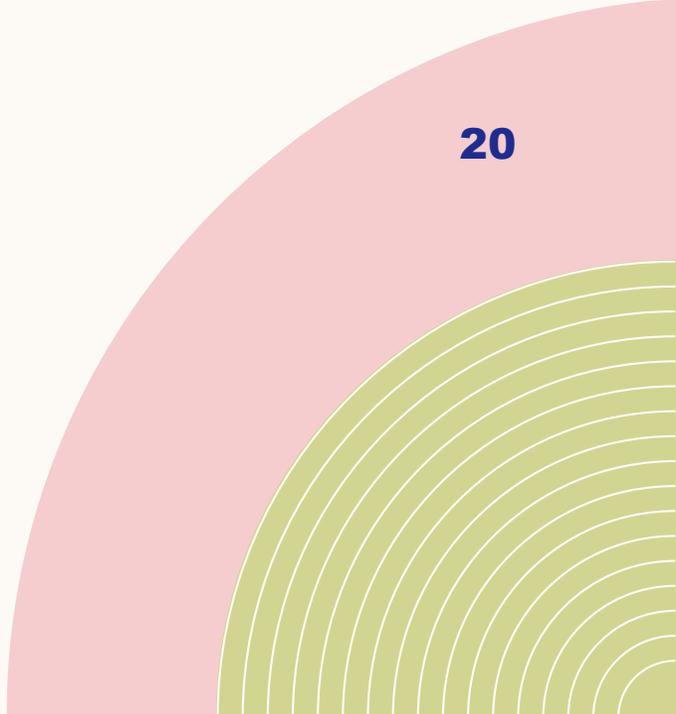
- Is the etiology of respiratory failure likely to respond favorably to NIV?

- **Step 2**

- Clinical presentation
- ABG analysis
- Monitored location
- Pre-hospital
- ED/Floor/Stepdown Unit
- ICU

- **Step 3**

- Exclude situations where NIV would be unsafe



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SUCCESSFUL APPLICATION OF NIV

Choose Ventilator

Choose Interface

Choose Settings

Work with Patient, Reassess and Adjust

Assess for Success/Failure/Weaning

MODES OF NIV

- CPAP
 - NIV with PSV (BIPAP)
 - Average Volume Assured Pressure Support (AVAPS)
 - Adaptive Servo Ventilation (ASV) or AutoSV
 - High Flow nasal cannula
-
- Deliver with oxygen to maintain adequate oxygen saturation
 - Humidification

MODES OF NIV



MODES OF NIV

Pressure Modes

- Better tolerated than volumecycled mode
- Constant positive airway pressure
(CPAP)
- Bilevel or biphasic positive airway pressure (BiPAP)
- Pressure support ventilation (PSV)

Volume Modes

- Initial TV range 10-15 ml/kg
- Control
- Assist control

INTERFACE



HOW DO WE SUPPLY NIPPV TO THE PATIENT? CPAP

- CPAP - applies a single pressure throughout the entire respiratory cycle
- Creates “pneumatic splint” for upper airway
- It does not augment TV but it does increase FRC
- Improve lung compliance
- Open collapsed alveoli
- Improve oxygenation
- Decrease work of breathing; Decrease LV transmural pressure, decrease afterload and increase CO
- Start at 5 cmH₂O
- Use higher pressure with obese patients and/or OSA

HOW DO WE SUPPLY NIPPV TO THE PATIENT? BIPAP

- NIV with PSV (BiPAP)
 - A specific pressure is applied to the airway for the duration of inspiration (IPAP)
 - A second pressure applied during expiration (EPAP)
 - IPAP - ventilation
 - EPAP – oxygenation
 - IPAP – EPAP = PSV
- MINIMUM DIFFERENCE BETWEEN I AND E NO LESS THAN 5 CM H₂O
 - S MODE, S/T MODE
 - TV VARIES
 - DETERMINED BY DEGREE OF IPAP
 - PATIENT EFFORT
 - LUNG COMPLIANCE

CONCLUSION



Multidisciplinary Teams



NIV





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Thanks for
your attention

