BETTER BREATHING

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Outline

- Mechanics of breathing
- Dyspnea
  - Causes
  - Treatments
    - Environment
    - Medications
    - Machines

What is Dyspnea???

Definition: uncomfortable awareness of breathing

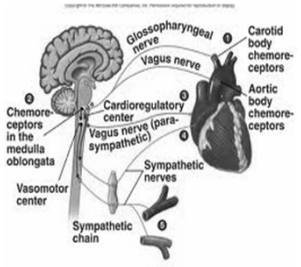
Suffocation
Not enough air
Smothering feeling

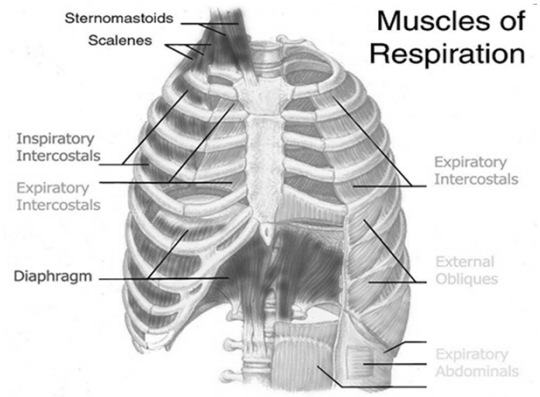
Dyspnea is not

A pulse ox #

Mechanics of breathing

- Brain
- Chemoreceptors
- Mechanoreceptors
- Nerves
- Muscles

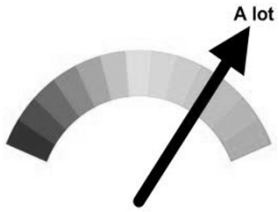




How common is dyspnea in our patients?

- 20%
- 45%
- 76.8%
- 90%

How common is dyspnea in our patients?



What Causes Dyspnea

- Obstructive Lung Disease
- Restrictive Lung Disease
- CHF
- Pleural Effusion or Pericardial effusion
- Anemia
- Pneumothorax
- Tumor
- Cardiac ischemia or arrhythmias

- Pneumonia
- Sleep apnea
- Radiation pneumonitis
- Ascites
- Paraneoplastic syndromes
- Atelectasis
- Superior Vena Cava syndrome

- Anxiety
- Psychosocial/Spiritual distress
- Hypoxemia
- Pulmonary Embolism
- Thick Secretions
- Respiratory muscle weakness
- Dying

SOAPBOX MOMENT

↑respiratory rate

≠ (always)

dyspnea

Mrs. Smith

86 yo s/p massive CVA
at KBR for 6 days
nothing po/IV for 1 week
RR 42 HR 114

2300:Resp rate 42 HR 114
2315: MS 2 mg IV given for ↑ RR
2345: Intervention successful, RR 6

Treatments

- Environmental adjustments
- Medications
- Treatments
- Machines

Treatments: Environment

- Temperature

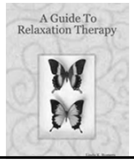
Treatments: Environment

Fans

Elevate head

Treatments: Environment

- Behavioral



Treatments: Environment

Treatments: Medications

- Opioids
- Antibiotics
- Bronchodilators and other respiratory meds
- Steroids
- Diuretics
- Anticoagulation
- Oxygen
- Blood transfusions/Epogen* – like meds

*Medications that Brent REALLY doesn't like

REVIEW Opioids for Dyspnea

Mechanism of action:

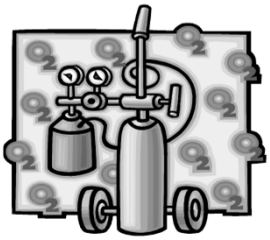
- Likely involves endogenous opioids and mu receptors
- PET imaging has identified cortical areas involved in dyspnea. Co-localized with pain perception.

REVIEW Opioids for Dyspnea

Pearls of wisdom:

- Dosed appropriately, opioids relieve dyspnea WITHOUT respiratory depression
- Opioids ↓ exercise induced dyspnea and ↑ exercise tolerance in COPD patients

Treatments: Oxygen



- Oxygen does not provide mechanical assistance to weak respiratory muscles
- Oxygen *may* be needed for:
  - Pneumonia from infection or aspiration
  - Must provide both oxygenation and assisted ventilation if muscle weakness and hypo-ventilation are present
  - During air travel
  - Palliative care

Oxygen – usually ***NOT*** - the best treatment for shortness of breath

SpO2 < 94% in absence of pulmonary disease indicates lung volume loss

Treatments: Therapies

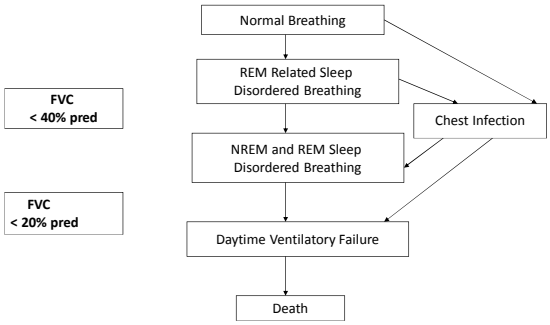
Always ask: ???

1. Prognosis (functional status)
2. Patient goals

Radiation
Surgery/stenting
Chemotherapy
Thoracentesis/Pleurodesis/tunneled catheter

Connie: Wondertherapist

Evolution of Respiratory Failure in NMD



Neuromuscular Respiratory Failure

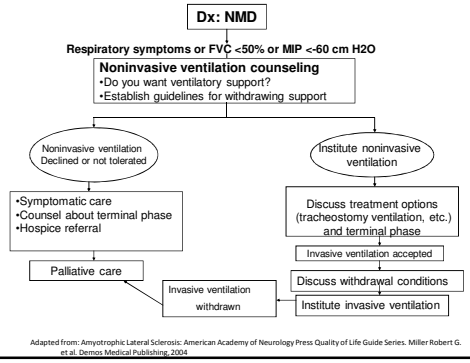
– is **NOT** a Pulmonary Disease

Inspiratory Muscle Failure
- Nocturnal hypoventilation
- Daytime hypoventilation
- Cough insufficiency
- Oxygen desaturation
- CO2 retention
- Rapid, shallow breathing and increased caloric expenditure
- Lack of ventilatory reserve
- Risk of acute decompensation

Upper Airway Muscle Failure
- Decreased upper airway respiratory muscle tone
- Poor glottic function – aspiration
- Cough insufficiency
- Sleep disordered breathing

Expiratory Muscle Failure
- Cough insufficiency

Respiratory Management of Neuromuscular Disease



Adapted from: Amyotrophic Lateral Sclerosis: American Academy of Neurology Press Quality of Life Guide Series. Miller Robert G. et al. Demos Medical Publishing, 2004

NIV Machines

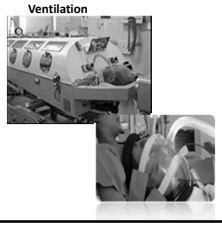
What are they and how do they work?

Any device that provides mechanical ventilation to the lungs using techniques that do not require an endotracheal airway (ET tube, Tracheostomy tube)

NPPV/CPAP/Bilevel (BiPAP)

NIV – Volume Ventilation

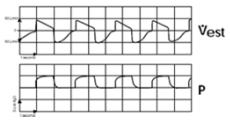
Negative Pressure Ventilation



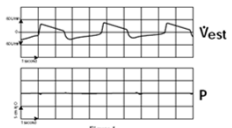
NIV Machines

BIPAP vs. CPAP

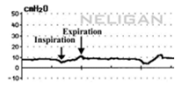
BIPAP



CPAP



- VPAP
- BIPAP S/T
- AVAPS



When To Initiate Assisted Ventilation

- Evidence of progressive muscle weakness
- Symptomatic (early morning headache, daytime sleepiness, confusion and memory impairment, increasing shortness of breath, increasing fatigue)
- Begin before there is danger of life-threatening acute respiratory failure
- Begin NPPV initially for nighttime symptoms to provide respiratory muscle rest and increase as needed (shorter periods may be used if patient has difficulty tolerating)

NPPV Ventilation

- **Goals**
  - should be comfortable for patient
  - should achieve SaO2 of 95% or higher on room air
  - prevent hypercapnia
  - assist patient to cough and clear secretions
  - provide improved oral communication
- **Interface**
  - nasal mask
  - full face mask
  - mouthpiece (even if using volume ventilator) unless significant bulbar impairment is present

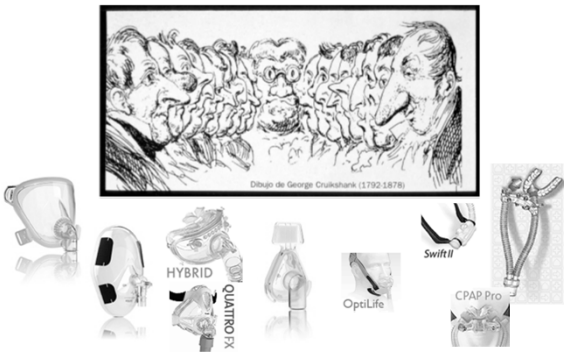
Starting NPPV

- **Masks**: While full facemasks are commonly used in the in-patient setting, some patients find these claustrophobic. Nasal masks tend to be better-tolerated, but they do not work as well in patients who are mouth breathers. Patient preference and clinician familiarity should guide this decision.
- **Settings**: Two parameters need to be set: the inspiratory positive airway pressure (IPAP) and end-expiratory positive pressure (EPAP). The breaths are usually triggered by the patient. On many devices it is possible to set a back-up rate if the patient does not trigger a breath spontaneously– this is inappropriate in dying patients receiving NPPV for symptom relief.
- **Strategies**: There are two general approaches to initiating NPPV settings: a 'high to low' approach and a 'low to high' approach, referring to the initial IPAP settings. The EPAP is usually set at 3-5 cmH2O. In order to maximize the tolerability of NPPV for symptom relief in dying patients, a 'low-high' approach is recommended. Start with a lower IPAP (8-10 cmH2O), and gradually increase as tolerated to achieve alleviation of dyspnea, decreased respiratory rate, increased tidal volume, and patient-machine synchrony.
- **Monitoring** Monitoring of pulse oximetry and arterial blood gases are not needed for patients using NPPV only for symptom control. Rather, the effect of NPPV should be assessed based on subjective improvement of dyspnea and decrease in respiratory rate. It is important to reassess patients frequently (looking specifically for respiratory rate, use of accessory muscles, and signs of anxiety), and to ask them if they are comfortable with the NPPV and deriving any benefit from it. Breaks from NPPV to eat, drink, and more freely communicate should be encouraged as much as patients desire.

Choosing the Correct Machine/Settings

- **Bi-level – not CPAP**
  - "Wide-span" pressure support (usually need at least a 10 cm H2O I/E span to move air)
    - Titrate IPAP
      - Usually range of 12 – 20 cm H2O
    - EPAP 3-4 cm H2O
  - Spontaneous/Timed Mode
    - Necessity of backup rate (REM sleep)
  - Rise time, TI max and trigger sensitivity
    - Increasing rise time may improve tolerance in bulbar patients
  - Volume ventilator – best for breath stacking
    - Can be used with face mask or mouthpiece unless upper airway is obstructed
    - Vt usually 800-1500 ml at rates of 10-12/minute

Those pesky masks



Who will benefit????

Consider Assisted Ventilation if –

- Patient is highly motivated and engaged in living
- Medical problems are stable or progressing slowly
- Can perform some ADL
- Able to communicate
- Patient and family understand pros and cons
- Caregiver support is available
- Resources are available for equipment
- Can use non-invasive ventilation on trial basis

May Want to Avoid Assisted Ventilation if –

- Disability is advanced
- Severe bulbar patients may not tolerate BiPAP
- Communication is very limited
- Interest/motivation for living is low
- Not mentally alert or self-directed
- Lack of caregiver/financial resources
- Unable to use non-invasive ventilation on trial basis

Challenges to NPPV

- Patient interface
- Mask leaks
- Skin irritation/breakdown
- Rhinitis
- Dry mouth
  - Heated humidifier
  - Chin strap
  - Increase hydration
- Aerophagia
  - Support head
- EPAP often set too high/IPAP often set too low
- Some patients may not tolerate NPPV. Allow use of NPPV as tolerated until patient adjusts
- Sialorrhea
- Thick secretions
- Oximetry is usually reliable
  - need for ABG usually unnecessary when room air ventilation is used
  - Neuromuscular patients with no other pulmonary problems will have a normal PaCO2 when SaO2 is 95% or higher

http://www.bestcpapprice.com/Sleep-Comfort-Care-Nose-Bridge-Pad-by-Sequal-Technologies_p_0-672.html

Volume –Cycled Ventilators

- Can be used either invasively or non-invasively
- Capable of delivering larger tidal volumes of air than NPPV units

Phillips Respironics Trilogy 100

Pulmonetic LTV 950

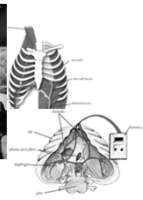
PORTABILITY

Issues with Invasive Ventilation

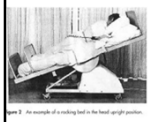
- Airway management
- Communication
- Financial
- May require as much as 19 or more hours per day caregiver time

Other Options for Respiratory Support

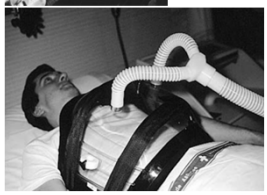
Pneumobelt



Diaphragmatic Pacing



Shell



Assisted Coughing

- Provide manual cough assist if VC is less than 1000 - 1500 ml
- Assisted cough flow must be at least 160 L/min to clear airway secretions
  - Once assisted peak cough flows are below 270 L/min teach manual and mechanically assisted coughing
  - Breath stack or provide maximal inspiration via self-inflating bag with mouthpiece or mask
- Caregiver applies quick inward, upward pressure to diaphragm as patient coughs or provide mechanical cough with in-exsufflator

Assisted Coughing

Figure 2

1. Take two slow, deep breaths to expand lungs
2. Breathe in again
3. Caregiver places hands on abdomen or lower rib cage, then quickly pushs inward and upward against the abdominal muscles to assist cough (Figure 2)
4. Exhale (it may help to attempt to cough), as the caregiver pushs the heels of their hands into the abdomen to help the diaphragm move up and expel air and phlegm.
5. Repeat procedure until the secretions are cleared.

AIRWAY CLEARANCE & COUGH AUGMENTATION

Secretions

- Overall volume of saliva varies from ½ - 2 quarts per day
- Thick saliva deep in throat
  - Hydration
  - Beta-blockers
- Sialorrhea
  - Amitriptyline
  - Glycopyrrolate
  - Atropine
  - Hyosine
  - Botulinum toxin injection
  - Irradiation

Neuromuscular Disease Quality of Life/Survival

- Respiratory muscle function is a key determinate of QOL and survival
- Non-invasive ventilation can increase survival by several months
- Invasive ventilation may increase survival more effectively but with a greater financial, emotional and caregiver burden
- Patients on long term ventilation can lead meaningful lives and few regret being on a ventilator
- When a patient can no longer tolerate non-invasive ventilation, or it becomes ineffective, he or she has to choose between tracheostomy and invasive ventilation or palliative care