Disclosure

- No planner, presenter, or speaker has any vested interest in the content to be discussed in this presentation.
- Your participation in this presentation will not guarantee that you will pass PCCN & CCRN exam.
- To receive CE Credits:
  - Sign the attendance sheet
  - Attend 80% of the course
  - Complete course evaluation

Objectives

- Identify nursing outcome goals in the management of patients requiring non-invasive O2 and Ventilatory delivery system
  - Nasal Cannula
  - Face Masks
  - Non-rebreather mask
  - BiPAP
  - CPAP
- Management of Patients with Tracheostomy for adequate ventilation & oxygenation
- Safe monitoring practices of PCU patients with regards to bedside procedures

Oxygen Delivery System

- Nasal Cannula (Maximum FiO2--0.40-0.50)—up to 5 L/min low flow
- Face mask (0.28-0.50)/ Trach mask/ T-piece
- Non-REbreather Mask (0.6 -0.7)
- CPAP/ BiPAP (positive pressure)
- Ventilators

Face Mask w/ O2 Entrainment System
**Oxygen Delivery Control**

Regulate white adaptor to add FiO2 from 35%--50%

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**Chronic Ventilatory Failure**

- Respiratory Muscle weakness/fatigue
- S/S: dyspnea, tachypnea, chest-abdominal asynchrony, elevated PaCO2, Acid-base imbalance
- Basic Tx:
  - BiPAP (PSV and PEEP)
  - CPAP
- Advanced Tx: Mechanical Ventilation

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**Regulation of Ventilation**

- **Brain Stem:** by medulla oblongata & Pons
  - Dorsal Resp group - basic rhythm of ventilation
  - Pneumotaxic center - limiting inhalation, trigger exhalation
  - Ventral Resp group - active during periods of increased ventilation
  - Apneustic center - regulates depth of respiration
- **Cerebral Cortex:** overrides the automatic control
- **Central Chemoreceptor:** responds to H+ as a result of increased PaCO2
- **Peripheral Chemoreceptor:** responds to PaO2, short term response to H+ and PaCO2
- **Other Receptor:**
  - Irritant receptors stimulates bronchoconstriction and hyperpnea
  - Hering-Breuer reflex: protects lungs from over-inflation
  - J receptors: stimulated by engorgement of the pulmonary capillaries & interstitial fluid volume → rapid shallow breathing

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**Obstructive Sleep Apnea--Risk Factors**

- Male gender
- Being overweight
- Being over the age of forty
- Having a large neck size (17 inches or greater in men and 16 inches or greater in women)
- Having larger tonsils
- Having a family history of sleep apnea

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**Sleep Disordered Breathing**

- Altered Sleep Patterns: due to pain, anxiety, fear, delirium, environment
- Obstructive Sleep Apnea: (snoring) irregular breathing pattern due to obstruction
- Central Sleep Apnea: (Instability in the respiratory control center)
  - Encephalitis
  - Stroke
  - Cervical Spine surgery
  - Neurodegenerative disease
  - Poliomyelitis

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**Non-Invasive Positive Pressure Ventilation CPAP & BiPAP**
CPAP & BiPAP

- Continuous Positive Airway Pressure (CPAP)
  - Continuous CPAP
  - Intermittent CPAP (30 min. Q 4hr)
  - Cyclic CPAP (2 hrs ON, 4 hrs OFF)
  - Night CPAP
- Bi-level Positive Airway Pressure (BiPAP)
  - IPAP (PSV) and EPAP (PEEP)
  - Nasal or Face Mask

Clinical Indications for NPPV

- Obstructive apnea
- Neuromuscular diseases
- Obstructive/restrictive lung disease with hypoxia and/or hypercapnea
- Chronic Hypoventilatory Syndromes
- Prevention of Intubation and Re-intubation following extubation
- Adjunctive treatment to allow night time rest

NPPV

Clinical Management Goals

- Adequate Gas Exchange
  - Assess LOC, Respiratory status Q 8 hr.
  - Check for appropriate equipment functions Q 2hr (adequate air flow, leak)
  - Reassess patient for the need of CPAP/BiPAP Q shift
- Prevention of Complication
  - Assess for skin breakdown Q 8hr
  - HOB elevation at least 30 degree

NPPV Use

Potential Complications

- Benefits of PEEP —keep alveoli open
- Low compliance state
- Improve ventilation-perfusion matching (fix hypoxemia)
- Drawbacks of PEEP —
  - Adverse hemodynamics—Hypotension, RAA system activation, hyponatremia (ADH)
  - Respiratory compromise—auto-PEEP
  - Lung trauma—barotrauma
  - Increase intracranial pressure
  - Decrease renal perfusion
  - Hepatic congestion
  - Worsening of intra-cardiac shunt

NPPV (CPAP & BiPAP) Clinical Indications in ARF patients

- ARF due to Hypoventilation
- ARF due to Hypoxemia
- Patients with chronic pulmonary emphysema
- Weaning to avoid re-intubation
- Obesity Hypoventilatoion syndrome
- Patients deemed “Not to be Intubated”
  - Some surgical patients

Indications for Tracheostomy

- Bypass acute and chronic upper airway obstruction
- Prolonged need for artificial airway
- Prophylaxis for anticipated airway problems
- Reduction of pulmonary aspiration
Tracheostomy Tubes
• Disposable Vs. Non-disposable
• Plastic Vs. Metal
• Shiley Vs. Jackson
• Cuffed Vs. Cuff-less
  – High Volume/ Low Pressure
  – < 25 mm Hg (14–25 mm H2O)
  – Tracheal Capillary pressure 20–30 mm H2O
• Inner Vs. Outer Cannula
• Fenestrated Vs. Non-fenestrated
• Passy-Muir Speaking valve/ “Corking”/“Capping”

SPO2 Measurement
• Continuous Vs. Intermittent
• Variables that may affect accuracy of Data:
  – Low perfusion state
  – Hypothermia
  – Poor skin contact (fever & shake)
  – Light source
  * ***Compare with ABG result***

Shiley Trach

Conscious Sedation

Trached Patient on a Vent
• Potential Complications:
  – Air leak (minimal occlusive technique or minimal air leak technique)
  – Aspiration
  – Tracheal Ischemia, necrosis, erosion, cuff herniation
• Tracheostomy cuff must be inflated during ventilation
• Cuff inflation does not prevent Aspiration !!!!!
• Provide mode of communication

Sedation—Definition
• Minimal Sedation:
  – Respond normally to verbal command, impaired cognitive and coordination functions
  – Normal ventilatory function
  – Normal CV function
• Moderate Sedation (Conscious Sedation):
  • Depressed LOC, respond appropriately to verbal commands with or without tactile stimulation
  • Patent airway and spontaneous ventilation w/o intervention
  • Normal CV function
**Deep Sedation**
- Depressed LOC, cannot be easily aroused, respond purposefully to repeated or painful simulation
- May require assistance in maintaining patent airway. Spontaneous ventilation may be impaired

**Anesthesia**
- Total loss of LOC, no response to painful stimulation
- Require assistance with ventilation
- CV function may be impaired

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**Conscious Sedation**

**Moderate Sedation**

**Deep Sedation**

**Anesthesia**

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### Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Initial Dose</th>
<th>Repeat Dose</th>
<th>Maximum Dose</th>
<th>Onset/Peak</th>
<th>Duration</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl</td>
<td>25-50 mcg</td>
<td>25-50 mcg</td>
<td>25-50 mcg</td>
<td>30 sec/2-5 min</td>
<td>30-60 min</td>
<td>2-4 hr (liver)</td>
</tr>
<tr>
<td>Midazolam</td>
<td>1-2.5 mg</td>
<td>2.5 mg</td>
<td>5 mg</td>
<td>1-3 min/5-7 min</td>
<td>20-30 min</td>
<td>1-15 hr (liver and renal)</td>
</tr>
<tr>
<td>Lorazepam</td>
<td>2-4 mg IV</td>
<td>5 mg</td>
<td>65 mg</td>
<td>3-7 min/5-10 min</td>
<td>5-60 min</td>
<td>8-12 hr</td>
</tr>
<tr>
<td>Diazepam</td>
<td>2-5 mg</td>
<td>5 mg</td>
<td>0.5 mg/kg Q 30-90 min</td>
<td>1-5 min/2-5 min</td>
<td>15-60 min</td>
<td>15-60 min</td>
</tr>
<tr>
<td>Flumazenil</td>
<td>0.2 mg</td>
<td>0.4 mg</td>
<td>2 mg</td>
<td>0.2 mg Q 1-2 min</td>
<td>5-10 min</td>
<td>80-120 min (liver)</td>
</tr>
<tr>
<td>Narcan</td>
<td>0.2 mg</td>
<td>0.4 mg</td>
<td>2 mg</td>
<td>0.2 mg Q 1-2 min</td>
<td>5-10 min</td>
<td>80-120 min (liver)</td>
</tr>
<tr>
<td>Propofol</td>
<td>2 mg/kg/min</td>
<td>5 mg/kg/min</td>
<td>10 mg/kg/min</td>
<td>0.5 mg/kg Q 1-2 min</td>
<td>1-2 min</td>
<td>3-12 hr</td>
</tr>
</tbody>
</table>

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**Bedside Procedures Requiring Conscious Sedation**
- Bronchoscopy
- EGD
- Chest Tube Placement
- Thoracentesis
- Paracentesis
Thoracentesis

- **Diagnostic or therapeutic**
  - Heparinized a 50-ml syringe
- **Patient Positioning & Prep**
  - Air removal vs. Liquid removal (sitting or side-lying)
  - Local Anesthetic
  - Site determined by CXR, CT, percussion
- **Risk Factors to the procedure**
  - Unstable hemodynamics
  - Coagulation defects
  - Mechanical ventilation
  - IABP
  - Uncooperative patients

**Complications:**
- Pain
- Pneumothorax (air introduction, puncture, rupture of visceral pleura)
- Reexpansion pulmonary edema (if > 1 to 1.5 liters)

**Pathophysiology of re-expansion Pulmonary**
- Increase negative pressure in intrapleural space
- If lungs do not expand to fill the space -> edema formation
- S/S: severe cough & SOB

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Chest Tube Insertion--Cont’d

- **Unexpected Outcomes:**
  - Hemorrhage/shock
  - Increasing respiratory distress
  - Infection
  - Damage to intercostal nerve resulting in neuropathy, neuritis
  - Incorrect tube placement
  - Chest tube kinking, clogging, or dislodgment from chest wall
  - Subcutaneous emphysema

**Patient Preparation after procedure:**
- Connect to Pleurovac—assure system functioning
- Suturing & Occlusive Dressing—CXR post procedure
- Is fluctuation in water seal chamber during Respiration normal?
- Is continuous bubbling normal?

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The patient just arrived to PCU from OR after Tracheostomy procedure. He violently coughs and the trach suddenly became dislodged. What is the quickest way to provide oxygenation to this patient?

1. Bag mask ventilation with 100% FiO2 according ACLS protocol
2. Re-insert the Trach using the obturator as a guide
3. Non Rebreather Mask with 100% O2
4. Immediate oral intubation by anesthesiologist

**Sample Question # 1**
A 52 year old male patient with BMI of 42 is admitted with hypertension. The patient is lethargic and has excessive daytime sleepiness. Pt's wife reports that he is usually tired all day and snores most of the night. Which of the following is initially indicated for the patient at this time?

1. Nutritionist consult for weight loss options
2. Evaluation for presence of left-sided heart failure
3. Request for a Neurology consult for evaluation of lethargy
4. Trial of continuous positive airway pressure

10/4/2013

What adverse events do you anticipate when sedatives are used during conscious sedation procedure?

1. Potential decrease in urine output, and SaPO2
2. Potential decrease in BP, SaPO2, and RR
3. Potential decrease in RR, SaPO2, and increase in BP
4. Potential decrease in O2 requirement, RR, and BP

10/4/2013

You are monitoring your patient undergoing bedside thoracentesis procedure. At what point would you consider your patient to be under a "Deep Sedation"?

1. When he requires repeated or painful stimulation to be aroused
2. When his cardiac rhythm is other than NSR
3. When he requires the use of Ambu-bag to support ventilation
4. Both 1 and 3

10/4/2013

MD suspected that the patient may have been overdosed with Versed previously administered. She asked for Narcan to reverse its affect. Which is your most appropriate response?

1. "Would you prefer 50 mg or 100 mg IV?"
2. "Would you prefer IVP or IV infusion?"
3. "Do you mean Flumazenil rather than Narcan?"
4. "Do you mean Fentanyl 50 mcg IV?"

10/4/2013

During a bronchoscopy procedure, patient's sapO2 continues to drop dramatically to 58% and patient begins to have frequent multi-focal PVC's. Which of the following is the most appropriate nursing action?

1. Make the MD aware of the changes, call a Code
2. Make the MD aware of the changes, prepare to administer 100% O2 via Ambu bag, continue to monitor ECG rhythm
3. Make the MD aware of the changes, document the event
4. Tell the charge nurse of the changes, prepare to administer 100 % O2, and complete an incident report

10/4/2013

Which of the following statements is true regarding Sedation?

1. The level of sedation is determined by the type of medication
2. The different levels of sedation are not clearly defined; it is a continuum
3. The individual response of each patient to a given medication is usually predictable
4. ERT activation is often avoided as not to alarm the patient

10/4/2013
Patient with Guillain-Barre syndrome, admitted with community acquired pneumonia. Her HR 113, BP 126/56, RR 32 on 6 liters O2 N/C. Her U.O. is 20 mls/hr and BUN/ Cr = 45/ 3.2. Bedside broncoscopy procedure is required. What do you need to keep in mind in your preparation for the procedure?

1. Insist that this patient be transferred to ICU for this procedure
2. The amount of sedatives used should be decreased by 50% given her renal and CNS status
3. Her response to the sedatives can be predicted
4. Her BP should be within +/- 5% from the baseline before less frequent monitoring is implemented

How can a nurse ensure safety for patient undergoing bedside thoracentesis procedure?

1. Check coagulation lab values before the procedure begins
2. Ensure that patient stays still during the procedure
3. Monitor vital signs frequently after the procedure is complete
4. All of the above

A patient receiving 28% humidified O2 via #6 Shiley tracheostomy in the past 2 days in PCU. She suddenly developed respiratory distress: RR 40's, O2 Sat drops to 60%. What is your initial nursing intervention?

1. Increase the FiO2 in the Trach Collar to 100%
2. Activate a Code Call
3. Provide ventilation via Ambu bag with 100% FiO2 after ensuring that trach cuff is inflated
4. Verbally try to calm her down as this may be due to her anxiety

How does paracentesis procedure improves patient’s respiratory status?

1. Removal of abdominal fluid allows for improved lung expansion
2. Removal of abdominal fluid alleviates the pain so that patient can breath better
3. Removal of abdominal fluid reduces the pre-load to the heart
4. Removal of abdominal fluid reduces stress to the kidneys

What are potential risks of mechanically ventilate air through a dislodged, newly established tracheostomy?

1. You may hurt the patient
2. You might introduce subcutaneous air through the incision that may lead to pneumothorax
3. You might close off the newly established tract
4. You might cause excessive bleeding

Which of the following conditions may indicate chest tube insertion in the 5th intercostal space?

1. Patient with large Pulmonary Edema on CXR
2. Patient with small pneumothorax on CXR post SC CVC placement
3. Patient with large Pleural effusion on CXR
4. Patient with large infiltrate, honey comb appearance on CXR
When assessing patient who has a chest tube, you notice that the water in the water-seal chamber rises and falls corresponding to respiratory cycle. What does this indicate?

1. Normal changes in central venous pressure
2. Normal changes in the pleural pressure
3. Slight tension pneumothorax
4. Presence of small air leak

Sample Question #14

Summary

Identify nursing outcome goals in the management of patients requiring non-invasive O2 and Ventilatory delivery system

• Nasal Cannula
• Face Masks
• Non-rebreather mask
• BiPAP
• CPAP

Management of Patients with Tracheostomy for adequate ventilation & oxygenation

Safe monitoring practices of PCU patients with regards to bedside procedures

References