**Respiratory Care Pocket Reference**

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**Oxygen Sources & Delivery Devices**

- **Nasal Cannula (NC)**
  - High flow: <3LPM, better tolerated, less need for sedation
  - Low flow: >5LPM, higher oxygen flow
  - High flow: >10LPM, better tolerated, less need for sedation
  - Low flow: <2LPM, worse tolerated, longer time for sedation

- **Non-Rebreather Mask (NRB)**
  - High flow: >15LPM, better tolerated, less need for sedation
  - Low flow: <10LPM, worse tolerated, longer time for sedation

- **High Flow Nasal Cannula (HFNC)**
  - High flow: >10LPM, better tolerated, less need for sedation
  - Low flow: <5LPM, worse tolerated, longer time for sedation

- **Continuous Positive Airway Pressure (CPAP)**
  - High flow: >15LPM, better tolerated, less need for sedation
  - Low flow: <10LPM, worse tolerated, longer time for sedation

**Choosing a Ventilator Mode**

- **Assisted Control (AC)**: Fixed minute ventilation is delivered if spontaneous breathing exceeds ventilator rate or SES.
  - Pro: More effective than spontaneous breathing.
  - Cons: Poor compliance, difficulty in weaning.

- **Pressure Control (PC)**: Fixed tidal volume is delivered if spontaneous breathing exceeds ventilator rate or SES.
  - Pro: More effective than spontaneous breathing.
  - Cons: Poor compliance, difficulty in weaning.

- **Volume Control (VC)**: Fixed tidal volume is delivered at a set respiratory rate.
  - Pro: More effective than spontaneous breathing.
  - Cons: Poor compliance, difficulty in weaning.

- **Synchronized Intermittent Mandatory Ventilation (SIMV)**: A combination of AC and PC.
  - Pro: More effective than spontaneous breathing.
  - Cons: Poor compliance, difficulty in weaning.

**Leakage**

- **Adverse Effects**
  - High leak: may cause hypoxemia and hypercapnia.
  - Low leak: may cause hypercapnia and hypoventilation.

**Respiratory Mechanics**

- **Minute Ventilation (MV)**: Calculated as VT x respiratory rate (RR).
  - Normal: >10 mL/kg<br>
  - Reduced: <7 mL/kg<br>

- **Peak Flow**
  - Normal: 10-20 LPM<br>
  - Reduced: <10 LPM<br>

- **Compliance (C)**
  - Normal: 0.05-0.1 mL/cmH2O<br>
  - Reduced: <0.05 mL/cmH2O<br>

- **Resistance (R)**
  - Normal: 0.1-0.3 cmH2O/ LPM<br>
  - Increased: >0.5 cmH2O/ LPM<br>

**Other Names**

- **AC-VC**: Assist Control/Volume Control<br>
- **CMV**: Continuous Mandatory Ventilation<br>
- **SIMV**: Synchronized Intermittent Mandatory Ventilation

**Other Parameters**

- **PEEP**
  - Positive End-Expiratory Pressure: Prevents alveolar collapse during exhalation.

**Positive End-Expiratory Pressure (PEEP)**

- **Pressure**
  - Pressure-controlled ventilation prevents alveolar collapse and promotes normal lung function.

- **Flow**
  - Flow-controlled ventilation provides a constant flow of gas to ensure adequate tidal volume.

- **Time**
  - Time-controlled ventilation ensures that each breath is delivered at a set time interval.

**Decelerating Flow**

- **Flow**
  - Flow decreases gradually after each breath to prevent hyperventilation.

**Constant Flow**

- **Flow**
  - Flow remains constant throughout each breath to ensure adequate ventilation.

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**Dual (Control)**

- **Pressure (P)**
  - PEEP, PSV, Spontaneous
  - PEEP: Pressure-Flow/Fixed Flow trigger, fixed time
  - PSV: Pressure Support
  - Spontaneous: No trigger, no time

- **Flow (F)**
  - Flow-Powered (FP): Flow deceleration, fixed time
  - Flow-Set (FS): Flow set, no time

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**Other Names**

- **P, PS, Spontaneous**
- **P, FP, FS**
- **P, PS, Spontaneous**
- **P, FP, FS**

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**Notes**

- **Ventilation is not a cure**
- **Adverse Effects**
  - High leak: may cause hypoxemia and hypercapnia.
  - Low leak: may cause hypercapnia and hypoventilation.
- **Respiratory Mechanics**
  - Minute Ventilation (MV) = VT x RR
  - Peak Flow = VT / TI
  - Tidal Volume (VT) = MV / RR
  - Inspiratory Flow (I) = VT / TI
  - Expiratory Flow (E) = VT / (VT + TI)
  - Inspiratory Time (TI) = VT / I
  - Expiratory Time (TE) = VT / E
  - Respiratory Rate (RR) = 60 / (TI + TE)
  - Residual Volume (RV) = VT x (RR / MV)
  - Inspiratory Reserve Volume (IRV) = VT x (RR / MV)
  - Inspiratory Time: inspiratory time divided by the total respiratory cycle time.
  - Expiratory Time: expiratory time divided by the total respiratory cycle time.

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**Pressure Support (PS)**

- **Pressure**
  - Pressure-controlled ventilation prevents alveolar collapse and promotes normal lung function.

- **Flow**
  - Flow-controlled ventilation provides a constant flow of gas to ensure adequate tidal volume.

- **Time**
  - Time-controlled ventilation ensures that each breath is delivered at a set time interval.

**Choosing a Ventilator Mode**

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**Respiratory Care, Setup, & Monitoring**
- Ensure all equipment is functional or readily available.
- Review patient’s medical history to understand risk factors for respiratory compromise.
- Ensure easy access to equipment, supplies, and personnel who can assist with ventilator setup.
- Use non-invasive ventilation if possible to avoid intubation.
- Monitor vital signs frequently.

**Lung-Protective Ventilation (LPV)**

### When to Use LPV
- **ARDS**
- **Acute Respiratory Distress Syndrome (ARDS)**
- **Severe Hypoxemia**
- **Acute Respiratory Failure**
- **Pneumothorax**
- **Acute Kidney Injury**

### Lung-Protective Ventilation (LPV) Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Target Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEEP</td>
<td>5-15 cm H2O</td>
</tr>
<tr>
<td>I:E Ratio</td>
<td>1:1-1:2</td>
</tr>
<tr>
<td>Peak Press</td>
<td>&lt;40 cm H2O</td>
</tr>
<tr>
<td>Mean Press</td>
<td>&lt;28 cm H2O</td>
</tr>
<tr>
<td>Nasal CPAP</td>
<td>5-10 cm H2O</td>
</tr>
</tbody>
</table>

### Additional LPV Reference Calculations

**Predicted Patient Weight (BMI) (kg):**

- Male: \( \frac{weight \times (height/100)}{71.8} \)
- Female: \( \frac{weight \times (height/100)}{71.8} - 10 \)

**Actual Patient Weight (BMI) (kg):**

- Male: \( \frac{weight \times (height/100)}{71.8} \)
- Female: \( \frac{weight \times (height/100)}{71.8} - 10 \)

**Additional LPV Reference Calculations**

- **P/F Ratio:**
  - \( \frac{P_{A}O_{2}}{F_{I}O_{2}} \)

**Sydney Values Corresponding to P/F Ratio:**

- **P/F Ratio:** 150-200
  - **Sydney Value:** 0.5
- **P/F Ratio:** 200-250
  - **Sydney Value:** 0.6
- **P/F Ratio:** 250-300
  - **Sydney Value:** 0.7
- **P/F Ratio:** 300-350
  - **Sydney Value:** 0.8
- **P/F Ratio:** 350-400
  - **Sydney Value:** 0.9
- **P/F Ratio:** >400
  - **Sydney Value:** 1.0

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**Discomfort, Pain, Anxiety, & Delirium**

- **Pain:**
  - **Assessment:** self-report, pain scales, vital signs
  - **Management:** non-pharmacologic, pharmacologic
- **Pain Management:**
  - **Oral Analgesics:** NSAIDs, opioids
  - **Intravenous Analgesics:** opioids, ketamine
- **Medication Administration:**
  - **Opioids:** starting dose, titration strategy
  - **Non-opioids:** starting dose, titration strategy
  - **Adjuvant Analgesics:** acetaminophen, tricyclic antidepressants

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**Ventilator Setup (geri) to connecting patients**

### Ventilator Performance

- **Perfect Full Flow Check**
  - Check ETT position
  - Check O2 delivery
- **Monitor Settings & Alarms**
  - **Inspiration Time:** 0.2-0.4 sec
  - **Expiration Time:** 0.4-0.6 sec
  - **Flow Rate:** 15-50 l/min

### Pneumothorax, Endotracheal Tube & Circuit Hygiene

- **Check cuff pressure and association (in) vs. (out) to ensure adequate cuff inflation, then deflate and inspect cuff and tube for damage, then re-inflate to 20-30 cm H2O
- **Check inflation of bag to ensure it remains inflated and intact.
- **Check ventilator circuit for any leaks, and inspect circuit for any damage in 24h.
- **Wipe down ventilator with approved disinfectant solution.

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**Respiratory**: 

- **Assess**, **Monitor**, **Manage**, **Minimize**
- **Continuous**
- **Non-invasive**
- **Invasive**

**Respiratory Monitoring**

- **Respiratory Rate**: 12-20 breaths/min
- **O2 Saturation**: \( \geq 92\% \)
- **Respiratory Sounds**: Clear
- **Skin Color**: Pink

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**Continuity Planning**

- **Ensure manual (i.e. bag-valve-mask) ventilator device is operational and ready to use with a backup and FV/RT team nearby.

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**Ventilator Wearing & Exhution**

- **SBT (Process and Consideration)**
  - **Patient Day:** Before intubation and FIO2 < 0.6, any patient may be considered for FIO2 < 0.6.
- **Ventilator Set:**
  - **Inspiration:** PEEP = 5-15 cm H2O
  - **Expiration Time (ET):** 0.4-0.6 sec

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**Weaning Strategies**

- **Assess**
  - **O2 Sat:** Before intubation and FIO2 < 0.6, any patient may be considered for FIO2 < 0.6.
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**Extracorporeal Oxygenation**

- **Current indications:**
  - **Pulmonary Hypertension**: \( \geq 50 \text{mmHg} \)
  - **Acute Respiratory Distress Syndrome (ARDS)**

**Patient-Ventilator Dysynchrony**

- **Preventing Dysynchrony:**
  - **Optimize patient position:** Prone positioning, changing body position, minimizing external distractions.
  - **Optimize ventilator settings:** PEEP, I:E ratio, respiratory rate.

**General Considerations**

- **Prevention of Ventilator-Associated Pneumonia (VAP):**
  - **Hand hygiene:** Before and after patient contact.
  - **PPE:** Use when appropriate.
  - **Antimicrobials:** Use per institutional guidelines.

**Conclusion**

- **Address any patient concerns and reinforce knowledge gained during educational sessions.

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**Imputed PaO2 Calculator**

- **Imputed PaO2:**
  - **Calculation:** \( \frac{P_{A}O_{2}}{F_{I}O_{2}} \)

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