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How to Use This Document

This is a living document, created by created by nurses, physicians, respiratory therapists and other healthcare providers from multiple institutions and multiple countries via the OpenCriticalCare.org project.

The goal of this document is to provide tools that can be locally modified to help healthcare providers learning to provide respiratory care for hospitalized patients.

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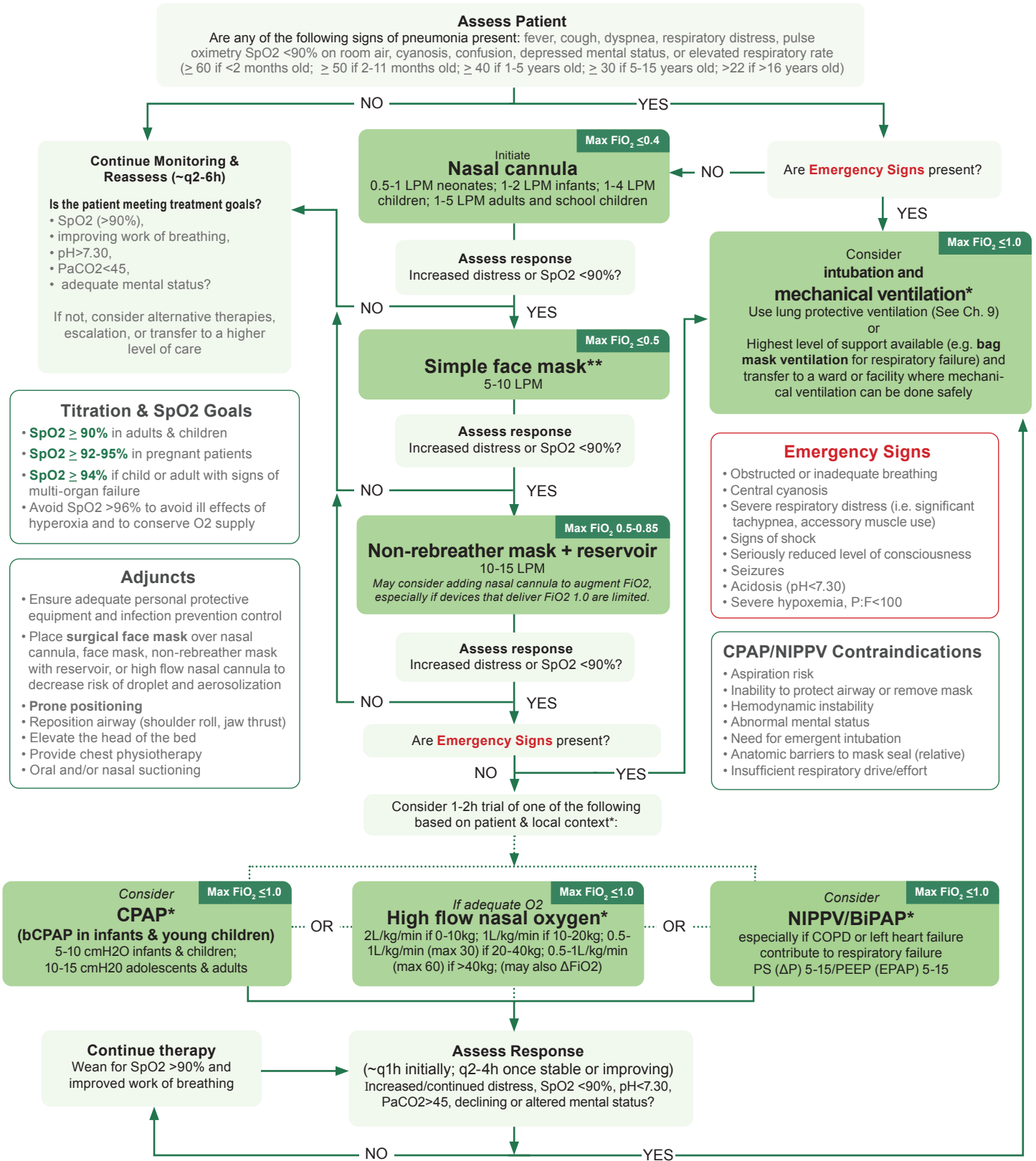
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Oxygen therapy escalation algorithm

Assess Patient
Are any of the following signs of pneumonia present: fever, cough, dyspnea, respiratory distress, pulse oximetry SpO2 <90% on room air, cyanosis, confusion, depressed mental status, or elevated respiratory rate ($\geq$ 60 if <2 months old; $\geq$ 50 if 2-11 months old; $\geq$ 40 if 1-5 years old; $\geq$ 30 if 5-15 years old; >22 if >16 years old)

— NO — / — YES —

Continue Monitoring & Reassess (~q2-6h)

Is the patient meeting treatment goals?
• SpO2 (>90%),
• improving work of breathing,
• pH>7.30,
• PaCO2<45,
• adequate mental status?

If not, consider alternative therapies, escalation, or transfer to a higher level of care

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Are Emergency Signs present?

— NO — / — YES —

Initiate — Max FiO$_2$ $\leq$0.4
Nasal cannula
0.5-1 LPM neonates; 1-2 LPM infants; 1-4 LPM children; 1-5 LPM adults and school children

Assess response
Increased distress or SpO2 <90%?

— NO — / — YES —

Simple face mask** — Max FiO$_2$ $\leq$0.5
5-10 LPM

Assess response
Increased distress or SpO2 <90%?

— NO — / — YES —

Non-rebreather mask + reservoir — Max FiO$_2$ 0.5-0.85
10-15 LPM
May consider adding nasal cannula to augment FiO2, especially if devices that deliver FiO2 1.0 are limited.

Assess response
Increased distress or SpO2 <90%?

— NO — / — YES —

Are Emergency Signs present?

NO / YES

Consider **intubation and mechanical ventilation*** — Max FiO$_2$ $\leq$1.0
Use lung protective ventilation (See Ch. 9) or
Highest level of support available (e.g. **bag mask ventilation** for respiratory failure) and transfer to a ward or facility where mechanical ventilation can be done safely

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Titration & SpO2 Goals
• **SpO2 $\geq$ 90%** in adults & children
• **SpO2 $\geq$ 92-95%** in pregnant patients
• **SpO2 $\geq$ 94%** if child or adult with signs of multi-organ failure
• Avoid SpO2 >96% to avoid ill effects of hyperoxia and to conserve O2 supply

Adjuncts
• Ensure adequate personal protective equipment and infection prevention control
• Place **surgical face mask** over nasal cannula, face mask, non-rebreather mask with reservoir, or high flow nasal cannula to decrease risk of droplet and aerosolization
• **Prone positioning**
• Reposition airway (shoulder roll, jaw thrust)
• Elevate the head of the bed
• Provide chest physiotherapy
• Oral and/or nasal suctioning

Emergency Signs
• Obstructed or inadequate breathing
• Central cyanosis
• Severe respiratory distress (i.e. significant tachypnea, accessory muscle use)
• Signs of shock
• Seriously reduced level of consciousness
• Seizures
• Acidosis (pH<7.30)
• Severe hypoxemia, P:F<100

CPAP/NIPPV Contraindications
• Aspiration risk
• Inability to protect airway or remove mask
• Hemodynamic instability
• Abnormal mental status
• Need for emergent intubation
• Anatomic barriers to mask seal (relative)
• Insufficient respiratory drive/effort

Consider 1-2h trial of one of the following based on patient & local context*:

Consider — Max FiO$_2$ $\leq$1.0
CPAP*
(bCPAP in infants & young children)
5-10 cmH2O infants & children; 10-15 cmH20 adolescents & adults

— OR —

If adequate O2 — Max FiO$_2$ $\leq$1.0
High flow nasal oxygen*
2L/kg/min if 0-10kg; 1L/kg/min if 10-20kg; 0.5-1L/kg/min (max 30) if 20-40kg; 0.5-1L/kg/min (max 60) if >40kg; (may also ΔFiO2)

— OR —

Consider — Max FiO$_2$ $\leq$1.0
NIPPV/BiPAP*
especially if COPD or left heart failure contribute to respiratory failure
PS (ΔP) 5-15/PEEP (EPAP) 5-15

Continue therapy
Wean for SpO2 >90% and improved work of breathing

Assess Response
(~q1h initially; q2-4h once stable or improving)
Increased/continued distress, SpO2 <90%, pH<7.30, PaCO2>45, declining or altered mental status?

— NO — / — YES —