

Ventilator Tip Sheet for non-Critical Care Respiratory Therapists and RT Extenders

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This tip sheet assists non-Critical Care Respiratory Therapists and Respiratory Therapy extenders (RNs and APPs) who may be called upon to assist in a pandemic.

Disclaimer: This document is provided for informational purposes only and it does not replace formalized training or knowledge.

Presentation

Patients with COVID-19 appear to have similar lung physiology to ARDS.

Acronyms

VT - Tidal Volume, amount of air inhaled with each breath
RR - Respiratory Rate
PEEP - Positive End Exp. Pressure
 P_{PLAT} - Plateau Pressure
Driving Pressure (DP) = P_{PLAT} - PEEP
Trigger - what is needed to start breath delivery to the patient
PIFR - Peak Inspiratory Flow Rate
PIP - Peak Inspiratory Pressure
MAP - Mean Airway Pressure
 T_i - Inspiratory time
 V_E - Minute Ventilation
PBW - Predicted body weight
 F_{IO_2} - Fraction of inspired oxygen (0.21-1.0 or 21%-100%)

Other important considerations

- For guidance on the use of other modalities such as prone positioning, epoprostenol, ECMO, or other therapies for severe hypoxemic respiratory failure, please consult your local protocols or guidelines.
- For more information on the biology, epidemiology, diagnostics, treatment and lab values related to COVID-19 refer to:

<https://onepagericu.com>

MODES OF MECHANICAL VENTILATION

Volume Control (VC)

- Settings: VT 4 - 6 mL/kg of PBW, RR 14 - 18 bpm, PEEP (see Table), T_i to achieve PIFR 40 - 60 L/min
- Trigger: 2 - 5 L/min for Flow trigger, -2 cmH₂O for Pressure trigger
- Alarms: High Pressure 5-10 above PIP, V_E 50% above and below actual V_E

Pressure Control (PC)

- Settings: Start at PIP 10-15 (adjust for VT goal), RR 14-18, PEEP (see Table), set T_i to ensure complete exhalation 1st, 2nd to make sure inspiratory flow waveform reaches baseline
- Trigger: 2 - 5 L/min for Flow trigger, -2 cmH₂O for Pressure trigger
- Alarms: High Pressure 5 - 10 above PIP, V_E 50% above and below actual V_E

RULES OF PROTECTIVE LUNG VENTILATION

- Tidal volume setting: 4 - 6 mL/kg PBW (max 8 mL/kg)
 - PBW in kg = 50 + 2.3 (height in inches - 60)
 - PBW in kg = 45.5 + 2.3 (height in inches - 60)
- Keep plateau pressure \leq 30 cmH₂O
 - Decrease VT by 1 mL/kg PBW if $P_{PLAT} > 30$ cmH₂O
 - Measure P_{PLAT} after any changes
- Titrate F_{IO_2} to maintain SpO₂ 92-96%
- Maintain driving pressure <15 cmH₂O (Driving pressure = P_{PLAT} - PEEP)

Consider low PEEP table for normal compliance/ low driving pressure

Lower PEEP/higher FiO₂

FiO₂	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7
PEEP	5	5	8	8	10	10	10	12

FiO₂	0.7	0.8	0.9	0.9	0.9	1.0
PEEP	14	14	14	16	18	18-24

Consider high PEEP table for low compliance/ high driving pressure

Higher PEEP/lower FiO₂

FiO₂	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5
PEEP	5	8	10	12	14	14	16	16

FiO₂	0.5	0.5-0.8	0.8	0.9	1.0	1.0
PEEP	18	20	22	22	22	24

Mode Names on Different Vents

Drager E4 and XL

- VC = CMV, PC = PCV+Assist

Drager V500

- VC = VC-AC, PC = PC-AC

Servo-I and Servo-U

- VC = VC, PC = PC

PB 840 or 980

- VC = A/C VC, PC = A/C PC

Viasys Avea

- VC = Volume AC
- PC = Pressure AC

Hamilton (G5, C3)

- VC=(S)CMV, PC=PCV+, P-CMV

Management Based on ABG

- Normal ABG ranges
 - pH: 7.35 - 7.45
 - P_{aCO_2} : 35 - 45 mmHg
 - P_{aO_2} : 60 - 100 mmHg
- To decrease P_{aCO_2} : $\uparrow V_E$
 - Increase rate or VT
- To increase P_{aCO_2} : $\downarrow V_E$
 - Decrease RR or VT
- To change respiratory rate:

$$(\text{Current } P_{aCO_2} \times \text{Current RR}) \div \text{Desired } P_{aCO_2} = \text{new RR}$$
- To increase P_{aO_2} : \uparrow PEEP by 2, and or $\uparrow F_{IO_2}$ by 10%
- Consider permissive hypercapnea to prevent ventilator induced injury, pH as low as 7.25