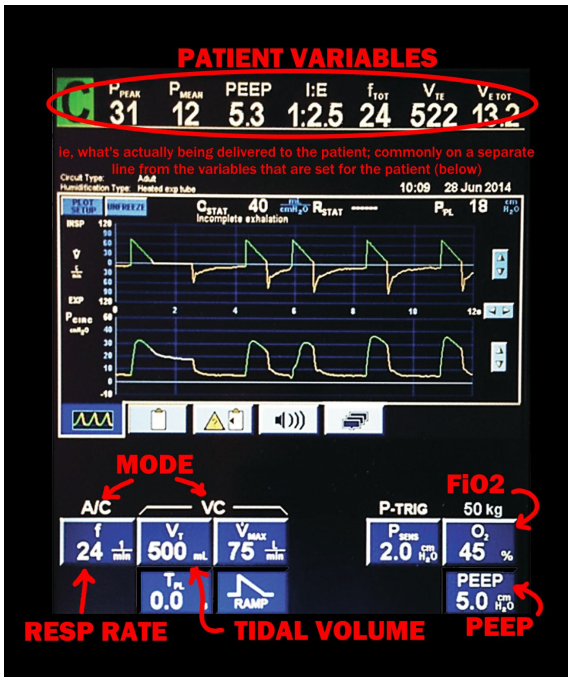
COVID-19 CHEATSHEET

- **Typical clinical course** (from limited data thus far):
  - ~15-20% of all COVID-19 patients hospitalized; ~5% of all COVID-19 patients require ICU care
  - Oxygen requirements:
    - Commonly only need nasal cannula initially to maintain O2 sats >= 90%
    - Then may quickly decompensate, requiring non-rebreather mask, followed shortly by intubation

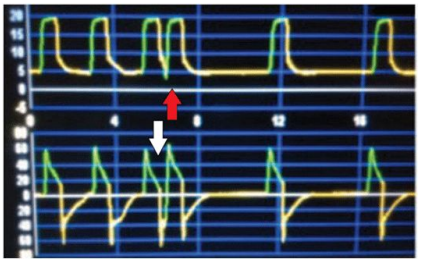


- **Impending respiratory failure**
  - Common symptoms:
    - Persistently increased respiratory rate (RR > 30)
    - Persistent hypoxemia (O2 sats < 90%)
    - Increased work of breathing (using neck, intercostal, and/or abdominal muscles to breathe)
  - As above, if rapidly increasing oxygen support (i.e., turning up O2 in nasal cannula, or increasing from nasal cannula to non-rebreather), expect respiratory failure
  - If respiratory failure appears imminent:
    - Have a low threshold to intubate
    - Call for Critical Care or Anesthesia, if available
    - DO NOT USE non-invasive ventilation (a.k.a. BiPAP, CPAP, NIV) or high-flow nasal cannula (a.k.a. HFNC, OptiFlow, AeroFlow), as these are thought to aerosolize the virus
  - Intubation should only be done by a qualified person, and will not be described here. If there are none available with impending respiratory arrest, consider insertion of a blind airway (e.g., LMA), but it is NOT recommended to "bag" the patient (especially without a HEPA filter+PEEP valve) unless absolutely necessary and for a defined time (i.e., while intubation is being set up).
- **Initial ventilator settings**
  - Multiple vent manufacturers mean too many styles to explain here, but there are 5 variables to look for and set:
    - **Mode:** this is the variable that may be the hardest to figure out, as it is described differently on nearly every model. "A/C VC, Volume Control, Volume A/C, ACV" are all correct
    - **Tidal volume:** calculated based on patient's gender and height (table right). If no height available, may use 450cc for males and 350cc for females
    - **Respiratory rate:** 12-15, considering the rate the patient was breathing at pre-intubation; may need to start with a higher RR (20-25) and adjust
    - **PEEP:** 5 cmH2O
    - **FiO2:** 100%

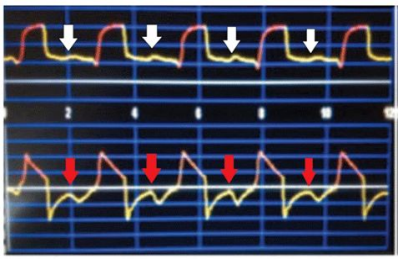
Male Patient: 450 ml **Female Patient: 350 ml**

Height		6 ml/kg Tidal Volume		Height		6 ml/kg Tidal Volume	
Inches	CM	Male	Female	Inches	CM	Male	Female
48	122	130	110	64	163	360	330
49	124	150	120	65	165	370	340
50	127	160	140	66	168	380	360
51	130	180	150	67	170	400	370
52	132	190	160	68	173	410	380
53	135	200	180	69	175	420	400
54	137	220	190	70	178	440	410
55	140	230	200	71	180	450	420
56	142	240	220	72	183	470	440
57	145	260	230	73	185	480	450
58	147	270	250	74	188	490	470
59	150	290	260	75	191	510	480
60	152	300	270	76	193	520	490
61	155	310	290	77	196	530	510
62	157	330	300	78	198	550	520
63	160	340	310	79	201	560	540

  - Vent shorthand
    - **Ppeak** = peak airway pressure; commonly causes a vent alarm
    - **I:E** = inspiratory time-to-expiratory time ratio; i.e., how much time is allowed for each phase of respiration. Can be important in high rates of respiration, as a too-short exhalation time can cause "breath-stacking" or "auto-PEEP" and be very deleterious.
    - **f** or $\mathbf{f_{TOT}}$ or **RR** = respiratory rate
    - $\mathbf{V_T}$ or $\mathbf{V_{TE}}$ = tidal volume, specifically the tidal volume of exhalation (what the vent measures)
    - $\mathbf{V_{E\,TOT}}$ or **MV** or $\mathbf{MV_E}$ = minute ventilation; simply respiratory rate multiplied by the tidal volume of each breath. This is what directly affects the pCO2 (i.e., how much the patient is ventilating).



- **Dyssynchrony**
  - Using these settings for mechanical ventilation, a.k.a. “low tidal volume ventilation” or “lung-protective ventilation” is uncomfortable
  - Generally need heavy sedation, and sometimes, patient is still dyssynchronous with the vent
    - Dyssynchrony looks like uneven/irregular waves on the ventilator, coughing/choking/gagging, diaphoresis/restlessness, and/or accessory muscle use between breaths



  - If patient heavily sedated and still dyssynchronous, consider neuromuscular blockade
    - Deeply sedate (“RASS -4”) using a combination of medications, commonly propofol + a narcotic (e.g., fentanyl) +/- a benzodiazepine (e.g., versed) +/- Precedex
    - Then add a paralytic, e.g., Nimbex (cisatracurium) or vecuronium
    - With the additional sedation, expect to need (additional) pressors
- **Troubleshooting**
  - Can’t oxygenate / hypoxic / PaO2 too low
    - Goal is PaO2 >= 60mmHg
    - To treat PaO2 < 60mmHg, adjust FiO2 or PEEP
    - If very hypoxic, go straight to FiO2 100%; patient can be downtitrated later
    - If adjusting PEEP, move in relatively small increments, e.g 5 → 8 → 10 → 12 → 14, and watch what happens in real-time (over ~2-3min per change). Recommend avoiding PEEP > 15 due to risk of lung injury
    - Can typically follow-up the results of these interventions by looking at the O2 sats, if resultant sats > ~90% and patient is perfused
    - Otherwise, follow-up with ABG in 30mins
  - Can’t ventilate / pCO2 too high / pH too low
    - Goal is pH > ~7.25
    - If pH is worse AND respiratory acidosis appears to be major contributor (i.e., pCO2 > ~55 without underlying COPD or similar comorbidities):
      - Can consider increasing RR, as long as adequate time for exhalation
      - If RR maxed out (typically high 20s, low 30s), can consider increasing tidal volume in small increments (~20-30cc/breath)
    - Follow up the results of any of these interventions with an ABG in 30mins
  - Vent alarms
    - High peak pressures / high airway pressures
      - Assess for inadequate sedation / vent dyssynchrony
      - Are they coughing? Do they need to be suctioned? (If so, in-line suctioning only)
      - Are they biting on the ETT? (Make sure a bite-block is in place)
      - If all of these things have been checked, lung compliance may simply be worsening
    - Low tidal volumes
      - Is the tubing connected?
      - Are the airway pressures too high? (if so, the vent will cut off the volume of the breaths delivered)
  - Examples (*Note: ABGs are typically written as pH / pCO2 / pO2*)
    - 7.18 / 82 / 65 92%
      - Increase RR *or*
      - Increase Vt
    - 7.34 / 70 / 196
      - Decrease FiO2 *or* (if FiO2 60% or less)
      - Decrease PEEP
    - 7.15 / 90 / 51
      - Increase RR or Vt *and*
      - Increase FiO2 or PEEP
    - 7.5 / 21 / 135
      - Ensure that pt is adequately sedated, and if so:
      - Decrease RR *or* Vt, *and*
      - Decrease FiO2 *or* PEEP

Lower PEEP/higher FiO2

FiO_2	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

FiO_2	0.7	0.8	0.9	0.9	0.9	1.0
PEEP	14	14	14	16	18	18-24

Higher PEEP/lower FiO2

FiO_2	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

FiO_2	0.5	0.5-0.8	0.8	0.9	1.0	1.0
PEEP	18	20	22	22	22	24

Note: this is the ARDSnet "PEEP ladder" that can be used as a rough guideline to titrate FiO2 and PEEP together as one or the other is turned up or down.