

Appendix 3  
 LifeFlight of Maine  
**Ventilatory Management of patients with COVID 19.**

**Note:** There has been significant discussion concerning the optimal strategy for ventilation of patients diagnosed with respiratory failure secondary to Covid-19. Although there are a variety of hypotheses on the ideal strategy to use in this population of patients, local tertiary care systems in Maine and New England are still applying that of the ARDSnet protocol. For this reason, LifeFlight of Maine will continue to utilize this ventilation strategy until both the literature has demonstrated that other options optimize patient care and the local healthcare intensive care providers adopt different care plans.

**Initial ARDS ventilation settings**

1. Set mode to volume control (AC/VC)
2. Set initial tidal volume (Vt):
  - a. VT equals 6 ML/KG (based upon ideal body weight from ARDSnet table, see below).
    - i. IBW men (kg) = 50 + 2.3 (height in inches - 60)
    - ii. IBW women (kg) = 45.5 + 2.3 (height in inches - 60)

NIH PREDICTED BODY WEIGHT (PBW) / TIDAL VOLUME CHART															
MALES							FEMALES								
HEIGHT		PBW	4	5	6	7	8	HEIGHT		PBW	4	5	6	7	8
Feet	Inches	Male	ml/kg	ml/kg	ml/kg	ml/kg	ml/kg	Feet	Inches	Female	ml/kg	ml/kg	ml/kg	ml/kg	ml/kg
4' 10"	58	45.4	180	230	270	320	360	4' 7"	55	34	140	170	200	240	270
4' 11"	59	47.7	190	240	290	330	380	4' 8"	56	36.3	150	180	220	250	290
5' 0"	60	50	200	250	300	350	400	4' 9"	57	38.6	150	190	230	270	310
5' 1"	61	52.3	210	260	310	370	420	4' 10"	58	40.9	160	200	250	290	330
5' 2"	62	54.6	220	270	330	380	440	4' 11"	59	43.2	170	220	260	300	350
5' 3"	63	56.9	230	280	340	400	460	5' 0"	60	45.5	180	230	270	320	360
5' 4"	64	59.2	240	300	360	410	470	5' 1"	61	47.8	190	240	290	330	380
5' 5"	65	61.5	250	310	370	430	490	5' 2"	62	50.1	200	250	300	350	400
5' 6"	66	63.8	260	320	380	450	510	5' 3"	63	52.4	210	260	310	370	420
5' 7"	67	66.1	260	330	400	460	530	5' 4"	64	54.7	220	270	330	380	440
5' 8"	68	68.4	270	340	410	480	550	5' 5"	65	57	230	290	340	400	460
5' 9"	69	70.7	280	350	420	490	570	5' 6"	66	59.3	240	300	360	420	470
5' 10"	70	73	290	370	440	510	580	5' 7"	67	61.6	250	310	370	430	490
5' 11"	71	75.3	300	380	450	530	600	5' 8"	68	63.9	260	320	380	450	510
6' 0"	72	77.6	310	390	470	540	620	5' 9"	69	66.2	260	330	400	460	530
6' 1"	73	79.9	320	400	480	560	640	5' 10"	70	68.5	270	340	410	480	550
6' 2"	74	82.2	330	410	490	580	660	5' 11"	71	70.8	280	350	420	500	570
6' 3"	75	84.5	340	420	510	590	680	6' 0"	72	73.1	290	370	440	510	580
6' 4"	76	86.8	350	430	520	610	690	6' 1"	73	75.4	300	380	450	530	600
6' 5"	77	89.1	360	450	530	620	710	6' 2"	74	77.7	310	390	470	540	620
6' 6"	78	91.4	370	460	550	640	730	6' 3"	75	80	320	400	480	560	640

3. Set initial respiratory rate
  - a. Typical starting rates will be 16 to 24 breaths per minute titrated to a goal minute ventilation of 5 to 8 L per minute
  - b. Consider starting rate of 24 to 28 breaths per minute titrated to goal minute ventilation of 8 to 12 L per minute in setting of acidosis (pH less than 7.25) pre-intubation
4. Set an initial peep based upon BMI empirically chosen targets
  - a. BMI less than 35: PEEP of 5
  - b. BMI greater than or equal to 35: PEEP of 10
5. Initial  $FiO_2$ : 100% on the intubation then rapidly ween  $SPO_2$  to 92–96% (Barrot et al, N Engl J Med, 2020)

### Determining PEEP and mechanics

1. Titrate  $FiO_2$  and PEEP for oxygenation
2. Initiate PEEP based upon BMI then titrate PEEP for  $FiO_2$  to target oxygenation  $SPO_2$  92–96% per the following guidelines.
  - a. BMI less than 35: titrate peep and  $FiO_2$  per the ARDSnet low BMI table

Low PEEP ARDSnet Table

$FiO_2$	0.3	0.4	0.5	0.5	0.6	0.7	0.7
PEEP	5	5	8	8	10	10	12

$FiO_2$	0.7	0.8	0.9	0.9	0.9	1
PEEP	14	14	14	16	18	18-24

- b. BMI greater than or equal to 35: titrate PEEP and  $FiO_2$  as per the ARDSnet high PEEP table.

$FiO_2$	0.3	0.3	0.3	0.3	0.3	0.4	0.4
PEEP	5	8	10	12	14	12	16

$FiO_2$	0.5	0.5	0.5-0.8	0.8	0.9	1	1
PEEP	16	18	20	22	22	22	24

3. If  $SPO_2$  is less than 92% or greater than 96%, then titrate PEEP and  $FiO_2$  according to High PEEP ARDSnet table as per BMI.
4. Special consideration: anecdotal reports of COVID-19 patients describe a compliant, higher PEEP dependent phenotype in which people management may not strictly adhere to specified ARDSnet tables (i.e. The  $FiO_2$  0.4 to 0.5, but does not tolerate PEEP less than 10)
5. Avoid elevated plateau pressures (with goal less than or equal to 30), particularly if using higher PEEP table.
6. Obtain respiratory mechanics:
  - a. Plateau pressure
  - b. Static compliance

**Sedation and ventilator synchrony**

1. Treat pain, agitation and delirium
2. The LifeFlight of Maine CCTTP protocols as outlined in:
  - a. CCTTP 2.5: Post intubation sedation, pain control, and muscle relaxants
3. Strategies include “pain first” approach (both assessment and treatment).
4. Use the lowest dose that can achieve the desired effect.
5. Note: Many preferred medications may change as drug availability and shortages exist.
  - a. Discuss with sending and receiving clinicians to determine if a bolus strategy or infusion strategy is indicated for sedative and analgesic medications.
6. If the patient is on a continuous infusion, boluses should be administered prior to starting the infusion as well as when infusions are titrated up to ensure adequate ongoing sedation and ventilator synchrony.
7. Achieve ventilator synchrony in order to reduce ventilator induced lung injury
  - a. Following rapid sequence intubation, ensure analgesia and sedation is started as soon as possible to target a RASS score of -2 to -3.
  - b. After paralytics are metabolized, assess patient synchrony with the ventilator (evidence of breath stacking, double triggering, and other ventilator alarms).
  - c. If synchronous, Layton sedation to lowest levels that maintain synchrony, ideally RASS score of zero to -1.
  - d. If not synchronous, escalate sedation as needed to achieve synchrony regardless of RASS score.
  - e. If the patient remains disinterest despite deep sedation (RASS score of -4 to -5), initiate paralytic and continue neuromuscular blockade to ventilator synchrony.

**Medications:**

1. Analgesics
  - a. Refer to [CCTTP 2.5 Post intubation sedation, pain control, and muscle relaxants](#)
2. Sedation
  - a. Refer to [CCTTP 2.5 Post intubation sedation, pain control, and muscle relaxants](#)
3. Muscle Relaxants
  - a. Refer to [CCTTP 2.5 Post intubation sedation, pain control, and muscle relaxants](#)
  - b. Additional reference for clinicians for alternative muscle relaxants that staff may encounter with patients with Covid-19.

**Types of Muscle relaxants / Paralytics with associated Pharmacokinetics**

	Cisatracurium	Vecuronium	Rocuronium
Duration/recovery	80-180	30-60	20-30
Renal excretion (%)	Hoffman Elimination	50	20-30
Effect renal failure	No change	Increased, especially metabolites	Minimal
Hepatic excretion (%)	Hoffman Elimination	35-50	<75
Effect hepatic failure	No change	Variable, mild	Moderate
Histamine release	No	No	No

Note: Adopted from Brigham and Women’s Hospital Covid 19 Management Guidelines.