Zoll Z Vent
Automatic Transport Ventilator Rapid Reference

Revised: 6.5.24

AdaCountyParamedics
We're in it for Life!

Inventory List

Item	Quantity
Main Compartment	
Vent (Clean, turns on, passes "Daily Operational Check"?)	**1 ea.**
- Confirm Battery Level	**> 50%**
White or Green oxygen supply hose ***with quick connect male adaptor***	**1 ea.**
Power Cable (Confirm Function in Daily Operational test)	**1 ea.**
Top Compartment	
CPAP Masks (Small , Med, Large)	**1 ea.**
CPAP Harness	**2 ea.**
Nebulizer	**1 ea.**
Extra regulator and "pig tail" female quick connect adaptor	**1 ea.**
Rear Compartment	
TEST Vent Circuit (clearly marked)	**1 ea.**
Test Lung	**1 ea.**
ADULT/PED Vent Circuit (in package, sealed)	**1 ea.**
HEPA Bacterial/viral Filters	**2-4 ea.**
Laminated Vent reference charts	**1 set**
In the Unit (Wall, cot, etc)	
O2 tank with regulator and "pig tail" female quick connect adaptor , full (<1900 PSI)	**1 ea.**
Extra ADULT/PED Vent Circuit (in package, sealed)	**1 ea.**
Extra INFANT/PED Vent Circuit (in package, sealed)	**1 ea.**
Extra CPAP Masks (Small , Med, Large)	**1 ea.**
Extra CPAP Harness	**2 ea.**

START HERE: Start Up & Operational Test

To perform the Start Up procedure, do the following:

1) **Connect appropriate patient circuit (Adult or Pedi).**
2) **Turn on ventilator; select the proper setting (e.g. Adult, Pediatric, CPAP, Custom)**
3) **After a breath or two, release the patient port while allowing the ventilator to operate. The PATIENT DISCONNECT alarm should activate.**
4) **Close the patient port with a clean gloved hand.**
   - **The HIGH AIRWAY PRESSURE LIMIT ALARM should activate after 2 breaths that reach the PIP High Limit.**
   - **If the AIRWAY PRESSURE HIGH ALARM fails to activate, check to determine that all of the circuit connections are secure, the exhalation valve is closing during inhalation, and that the High Airway Pressure Limit is set to 35 cm H2O or less.**
5) **Connect the Test Lung and adjust settings for your patient. Visually confirm the ventilator is functioning properly prior to placing on your patient.**

Keep BVM with Mask in arms reach of the patient at all times in case of complications

For Daily Operational Test continue below:

6) Press the Manual Breath button; gas should flow out of the patient connection each time the button is pressed

7) With no other alarms occurring, remove external power from the ventilator.

- **The EXTERNAL POWER - LOW / DISCONNECT alarms should activate. Reconnect external power to reset alarms.**
- **If either the HIGH AIRWAY PRESSURE, PATIENT DISCONNECT, or EXTERNAL POWER LOW / DISCONNECT alarms fail to activate, continue to manually ventilate the patient, check the patient circuit for leaks or a faulty exhalation valve and repeat the Operational Test.**

8) Confirm Battery level

ADULT MALE: 15+ years /Over 4’7”

Height	I/PBW KG	Est. Vt 4ml/kg	Est. Vt 6ml/kg	Est. Vt 8ml/kg	Est. Vt 10ml/kg	Est. Mv 100-200ml/kg	
Revert to 4'7" tidal volume for all Pts below 4'7" Add 20ml for each 1" for each 1" above 6'8"							
*For Vt < 200 ml, use Infant/Ped Circuit or set at Vt @ 200 ml							
4'7"	39	156	234	312	390	4700	9400
4'8"	41	164	246	328	410	4100	8200
4'9"	43	172	258	344	430	4300	8600
4'10	45	180	270	360	450	4500	9000
4'11	48	192	288	384	480	4700	9400
5'0"	50	200	300	400	500	5000	10000
5'1"	52	208	312	416	520	5200	10400
5'2"	55	220	330	440	550	5500	11000
5'3"	57	228	342	456	570	5700	11400
5'4"	59	236	354	472	590	5900	11800
5'5"	62	248	372	496	620	6200	12400
5'6"	64	256	384	512	640	6400	12800
5'7"	66	264	396	528	660	6600	13200
5'8"	68	272	408	544	680	6800	13600
5'9"	71	284	426	568	710	7100	14200
5'10"	73	292	438	584	730	7300	14600
5'11"	75	300	450	600	750	7500	15000
6'0"	78	312	468	624	780	7800	15600
6'1"	80	320	480	640	800	8000	16000
6'2"	82	328	492	656	820	8200	16400
6'3"	85	340	510	680	850	8500	17000
6'4"	87	348	522	696	870	8700	17400
6'5"	89	356	534	712	890	8900	17800
6'6"	91	364	546	728	910	9100	18200
6'7"	94	376	564	752	940	9400	18800
6'8"	96	384	576	768	960	9600	19200

Source: Adapted from ARDSNET www.ardsnet.org

ADULT MALE: 15+ years /Over 4’7”

ADULT Female: 15+ years /Over 4'7"

Height	I/PBW KG	Est. Vt 4ml/kg	Est. Vt 6ml/kg	Est. Vt 8ml/kg	Est. Vt 10ml/kg	Est. Mv 100-200ml/kg	
Revert to 4'7" tidal volume for all ADULT Pts below 4'7" Add 20ml for each 1" for each 1" above 6'8"							
*For Vt < 200 ml, use Infant/Ped Circuit or set at Vt @ 200 ml							
4'7"	34	136	**204**	272	340	*3400*	*6800*
4'8"	36	144	**216**	288	360	*3600*	*7200*
4'9"	39	156	**234**	312	390	*3900*	*7800*
4'10"	41	164	**246**	328	410	*4100*	*8200*
4'11"	43	172	**258**	344	430	*4300*	*8600*
5'0"	46	184	**276**	368	460	*4600*	*9200*
5'1"	48	192	**288**	384	480	*4800*	*9600*
5'2"	50	200	**300**	400	500	*5000*	*10000*
5'3"	52	208	**312**	416	520	*5200*	*10400*
5'4"	55	220	**330**	440	550	*5500*	*11000*
5'5"	57	228	**342**	456	570	*5700*	*11400*
5'6"	59	236	**354**	472	590	*5900*	*11800*
5'7"	62	248	**372**	496	620	*6200*	*12400*
5'8"	64	256	**384**	512	640	*6400*	*12800*
5'9"	66	264	**396**	528	660	*6600*	*13200*
5'10"	68	272	**408**	544	680	*6800*	*13600*
5'11"	71	284	**426**	568	710	*7100*	*14200*
6'0"	73	292	**438**	584	730	*7300*	*14600*
6'1"	75	300	**450**	600	750	*7500*	*15000*
6'2"	78	312	**468**	624	780	*7800*	*15600*
6'3"	80	320	**480**	640	800	*8000*	*16000*
6'4"	82	328	**492**	656	820	*8200*	*16400*
6'5"	85	340	**510**	680	850	*8500*	*17000*
6'6"	87	348	**522**	696	870	*8700*	*17400*
6'7"	89	356	**534**	712	890	*8900*	*17800*
6'8"	92	368	**552**	736	920	*9200*	*18400*

Source: Adapted from ARDSNET www.ardsnet.org

ADULT Female:15+ years /Over 4'7"

PEDS < 14 years old /Under 4'7

PEDIATRIC: ≥ 14 years old / Under 4'7""

Age	I/PBW KG	Est. Vt 4ml/kg	Est. Vt 6ml/kg	Est. Vt 8ml/kg	Est. Vt 10ml/kg	Est. Mv 100-200ml/kg		BPM
<1	< 5kg			CONTRAINDICATED				
1	10	40	60	80	100	1000	2000	30 (25-45/min)
2	12	48	72	96	120	1200	2400	30 (25-45/min)
3	14	56	84	112	140	1400	2800	25 (20-30/min)
4	16	64	96	128	160	1600	3200	25 (20-30/min)
5	18	72	108	144	180	1800	3600	25 (20-30/min)
6	25	100	150	200	250	2500	5000	25 (20-30/min)
7	28	112	168	224	280	2800	5600	20 (16-25/min)
8	31	124	186	248	310	3100	6200	20 (16-25/min)
9	34	136	204	272	340	3400	6800	20 (16-25/min)
10	37	148	222	296	370	3700	7400	20 (16-25/min)
11	40	160	240	320	400	4000	8000	20 (16-25/min)
12	43	172	258	344	430	4300	8600	20 (16-25/min)
13	46	184	276	368	460	4600	9200	16 (range 10 - 20)
14	49	196	294	392	490	4900	9800	16 (range 10 - 20)

For Grey Area consider Adult IPBW charts
For Vt > 300 ml , use Adult/Ped Circuits

For children whose height is over 4"7
USE ADULT CHARTS

PEDS < 14 years old /Under 4'7

HOW TO USE DURING CPR

(1) **Select Custom** in start-up menu.

(2) **Confirm** at **FIO2** at **100**.

(3) **Confirm PIP ALARM** of **100**.

(4) **Confirm PEEP** to **3-5**.

(5) **Set Vt** to **6 ml/kg** I/PBW (Use Chart)

(6) **Confirm BPM** to **8**.

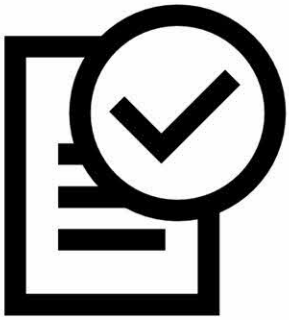
(7) **Confirm mode** for **AC (v).**

(8) **Confirm trigger** to **–6.0**.

Will observe reduced tidal volumes when breath and compression occur simultaneously.

(9) If ROSC occurs -> Return to standard settings and Set mode to SIMV (v).

(10)If ROSC occurs: Do not forget to **sedate appropriately**



D.O.P.E.R.S.

D - Displacement of tube:
- Attach end-tidal CO2 to verify tube placement (Mandatory)
- Check depth (cm at lip).

O - Obstruction of tube/circuit :
- Use suction catheter to remove mucus from tube and make sure patient is not biting down.
- Insure that inline suction catheter is not partially blocking ETT tube.

P – Pneumothorax :
- Auscultate, assess, visualize chest wall, and perform needle decompression if needed.

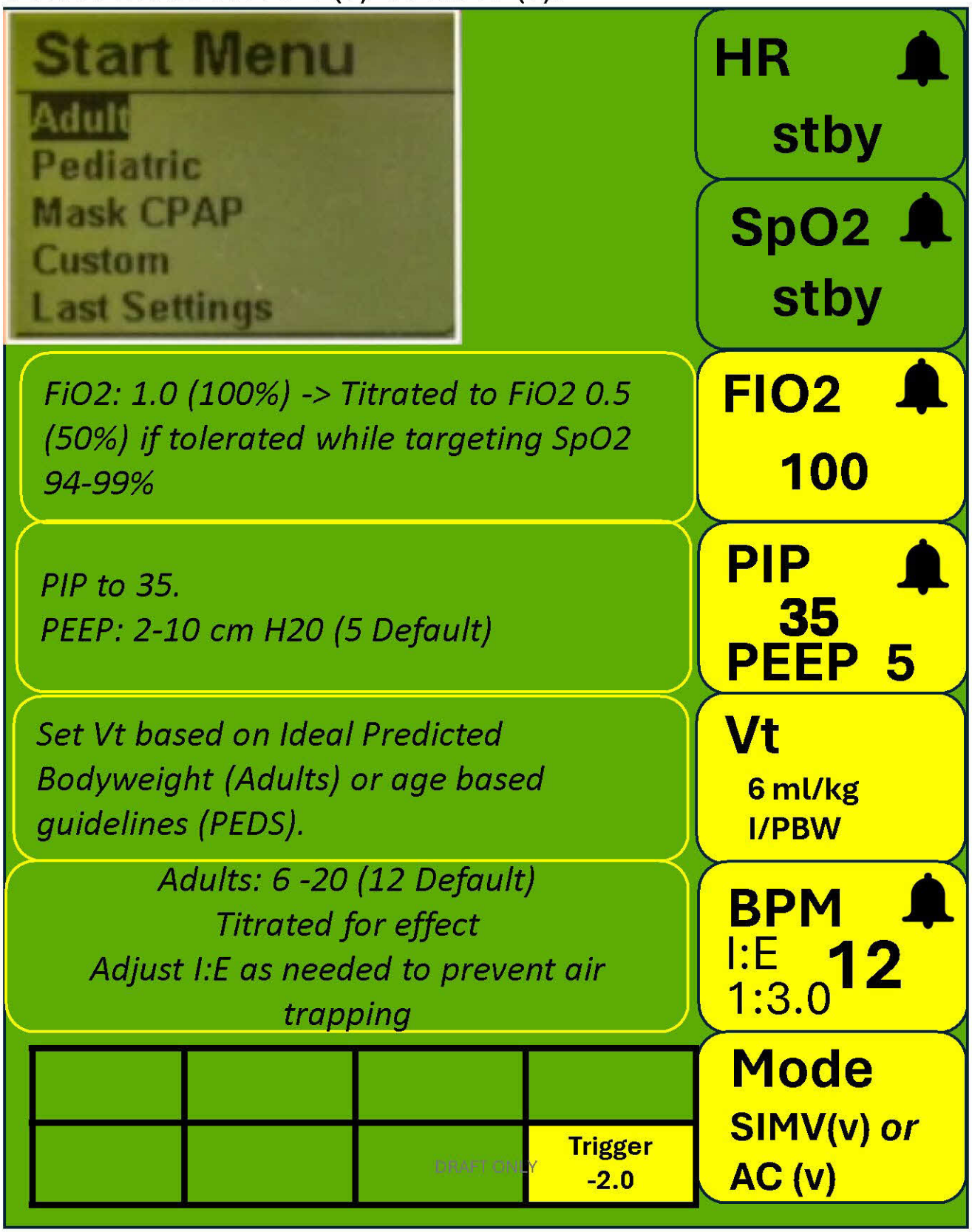
E - Equipment failure :
- Connect to BVM to buy time to evaluate your patient and the ventilator.
- Check O2 levels and flow rate

R - Rigidity/Resistance to Ventilation
- Evaluate sedation and paralysis
- Evaluate for Pneumo and Stacked Breaths

S - Stacked breaths - Auto-PEEP especially in COPD/Asthma:
- Disconnect from ventilator and allow open circuit exhalation.
- Increase I:E ratio (1:4), Decrease Respiratory rate or Tidal volume (or both) if tolerated.
- Consider bronchodilators and/or ETT suctioning.
- Consider opening circuit to atmosphere and allowing exhalation.

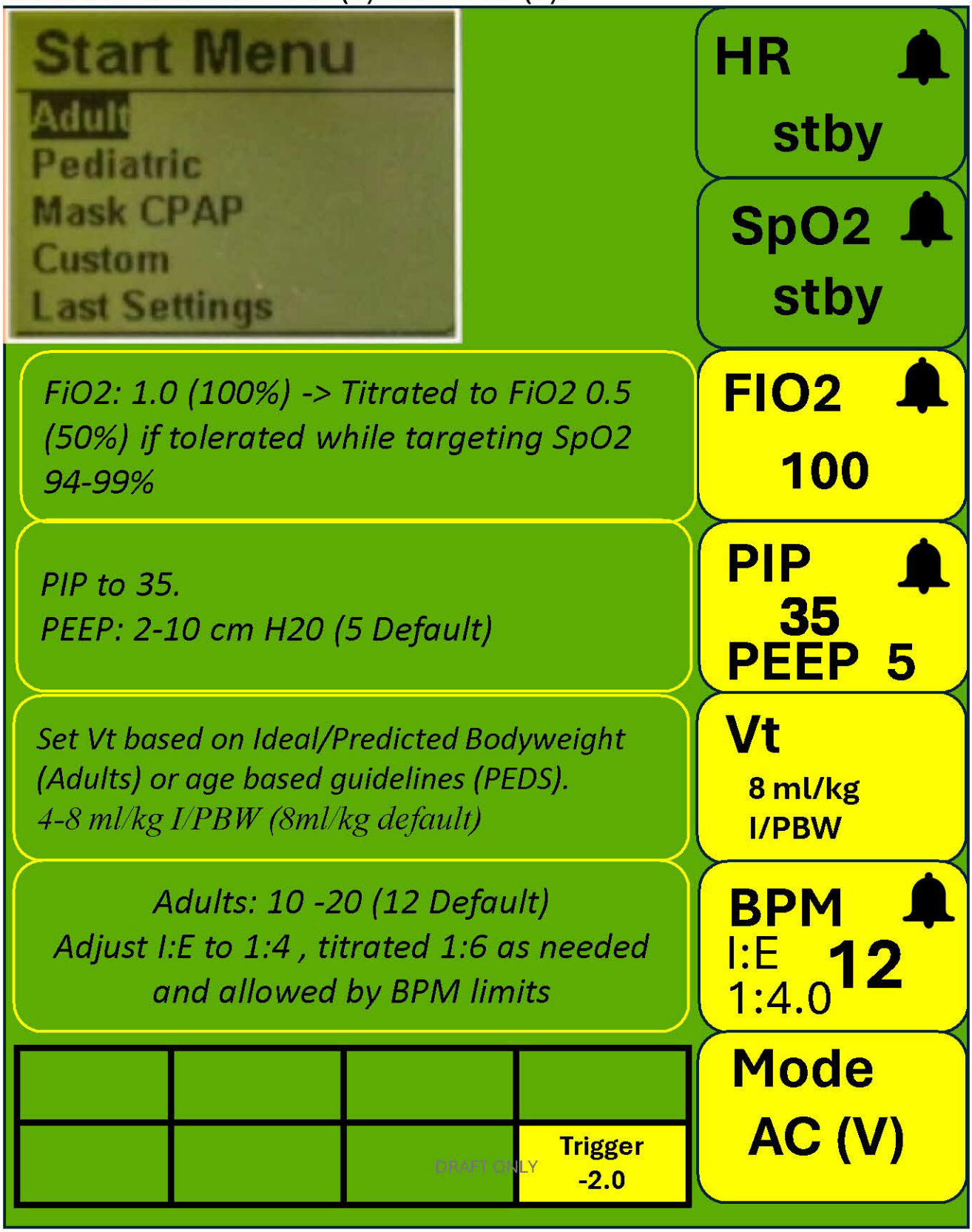
Adult Standard

When indicated: Select **ADULT** from start menu.
Start at **FIO2 at 100** and titrate to SPO2 of 94%.
Adjust **PEEP** to 5. **Set Vt** to **6** ml/kg I/PBW
Adjust **BPM**.
Select mode for A/C (v) or SIMV (v).



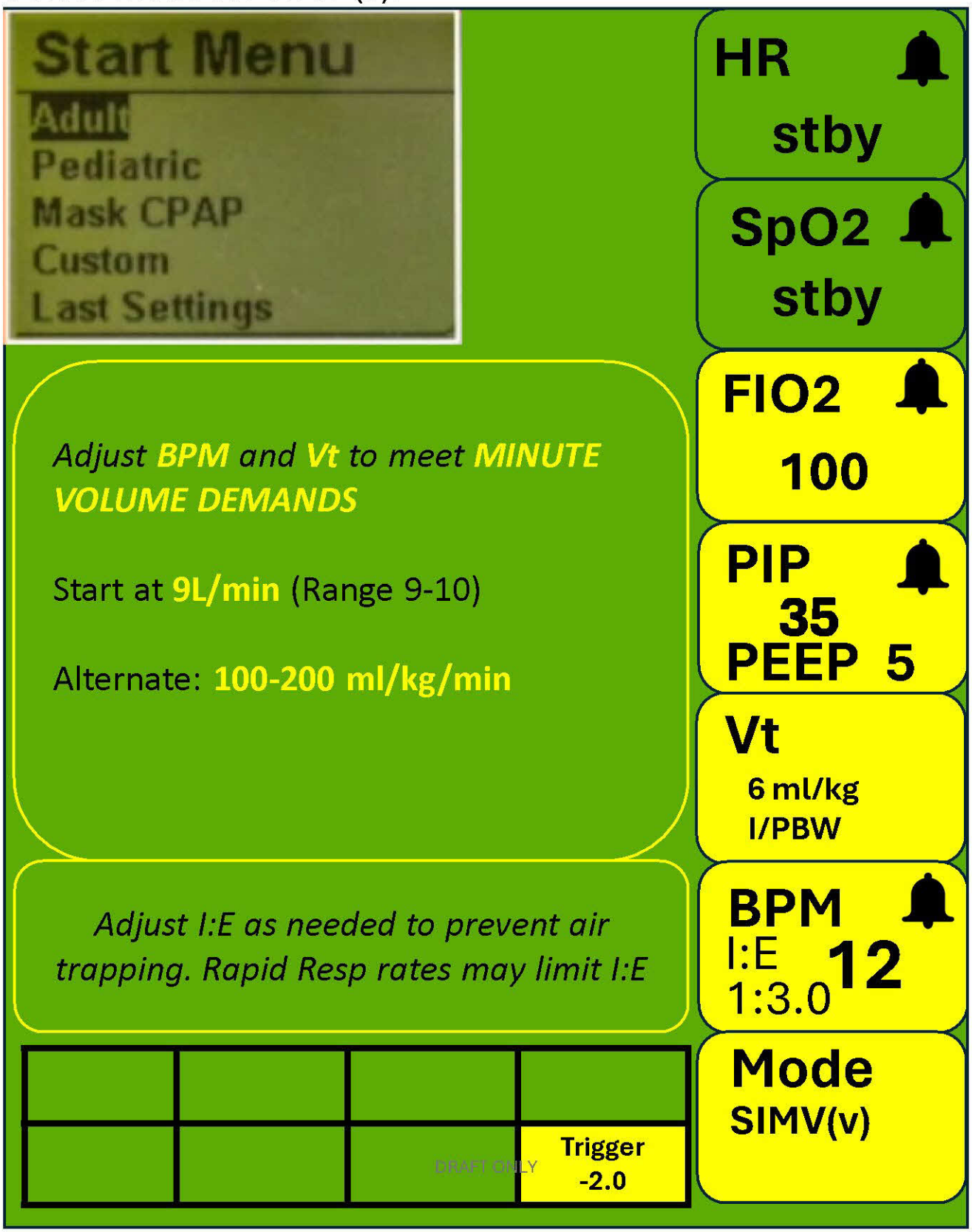
Adult Obstructive: (Asthma, COPD, etc)

When indicated: Select **ADULT** from start menu.
Start at **FIO2 at 100** and titrate to SPO2 of 94%.
Adjust **PEEP** to 5. **Set Vt** to **8** ml/kg I/PBW
Adjust **BPM**. Adjust **I:E to 1:4**
Select mode for A/C (v) or SIMV (v).



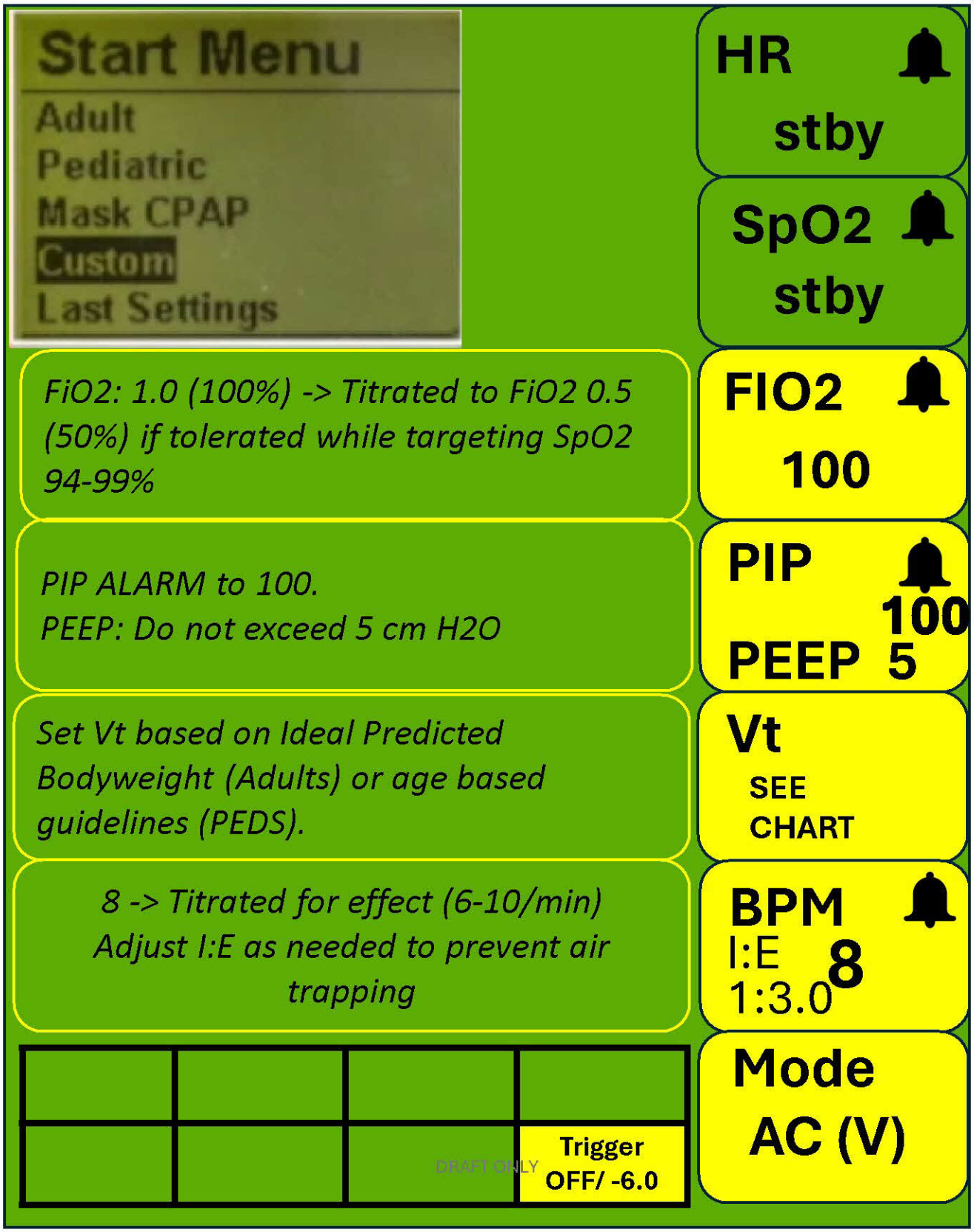
Adult Metabolic Acidosis

When indicated: Select **ADULT** from start menu.
Start at **FIO2 at 100** and titrate to SPO2 of 94%.
Adjust **PEEP** to 5. **Set Vt** to **8** ml/kg I/PBW. Titrate PRN.
Adjust **BPM** and **Vt** to meet **MINUTE VOLUME DEMANDS**
Select mode for SIMV (v).



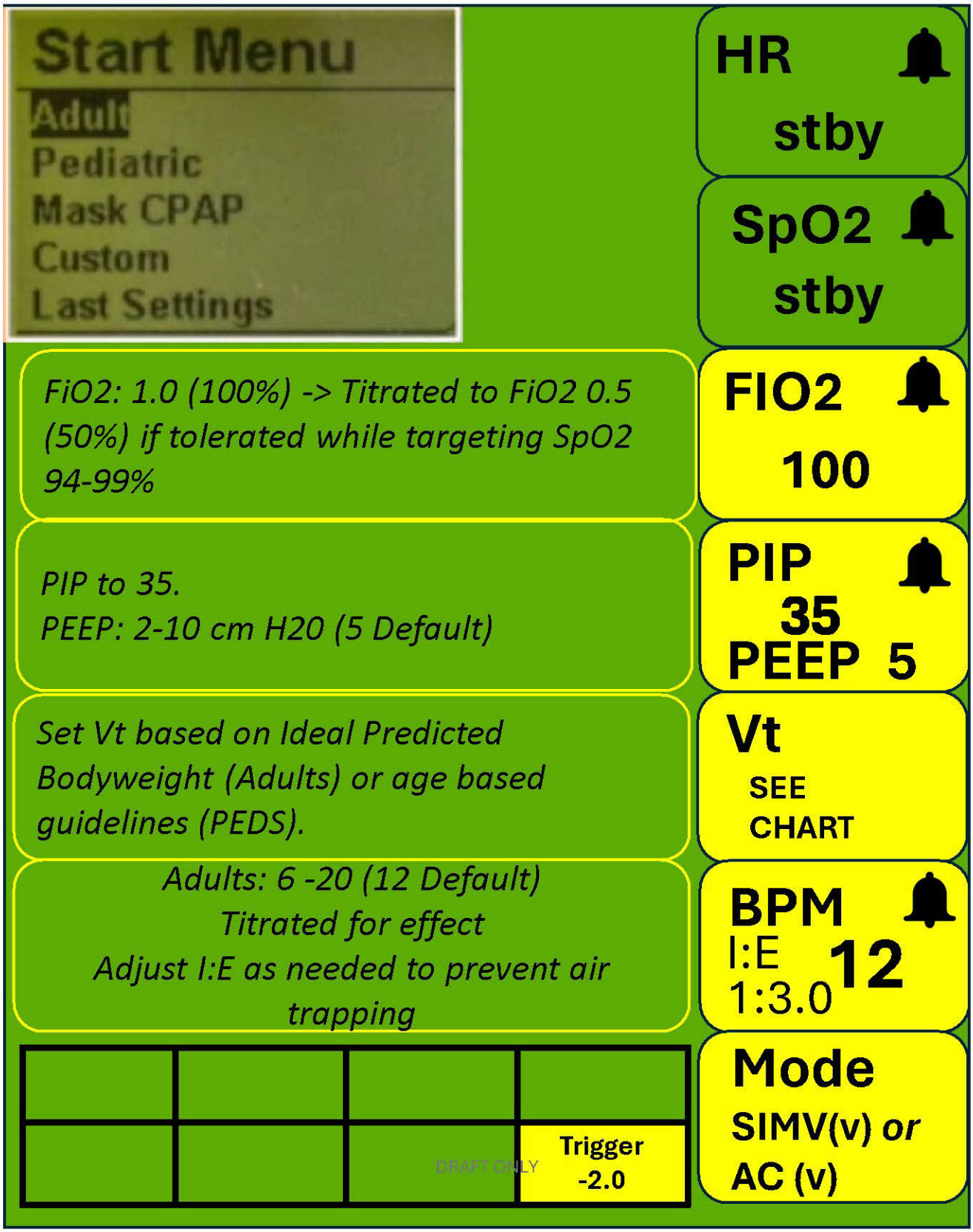
Adult Cardiac Arrest (CUSTOM)

Select CUSTOM SETTINGS in start up menu.
Confirm at **FIO2** at **100**.
Confirm PIP ALARM to 100.
Confirm PEEP to **3-5**. **Set Vt** to **6 ml/kg** I/PBW (Use Chart) **Confirm BPM** to **8**. **Confirm mode** for **AC (v)**. **Confirm trigger** to **–6.0**.



Adult POST ROSC

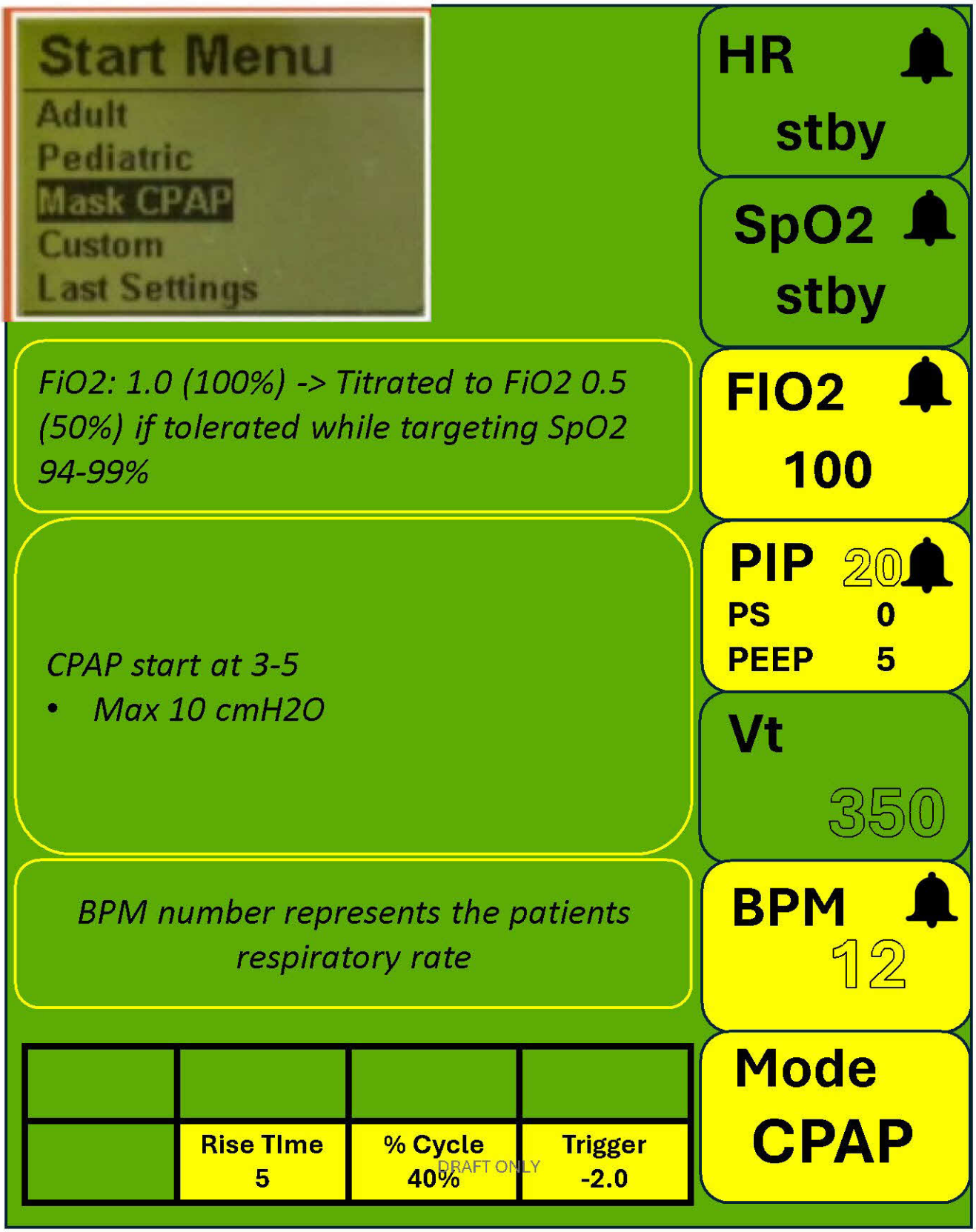
When patient has return of spontaneous circulation. Turn vent **off and on** again. Select **ADULT** from start menu.
Start at **FIO2 at 100** and titrate to SPO2 of 94%.
Adjust **PEEP to 5**. Set **Vt to 6 ml/kg** I/PBW
Adjust BPM to **12** BPM
Select mode for **A/C (v) or SIMV (v).**



CPAP

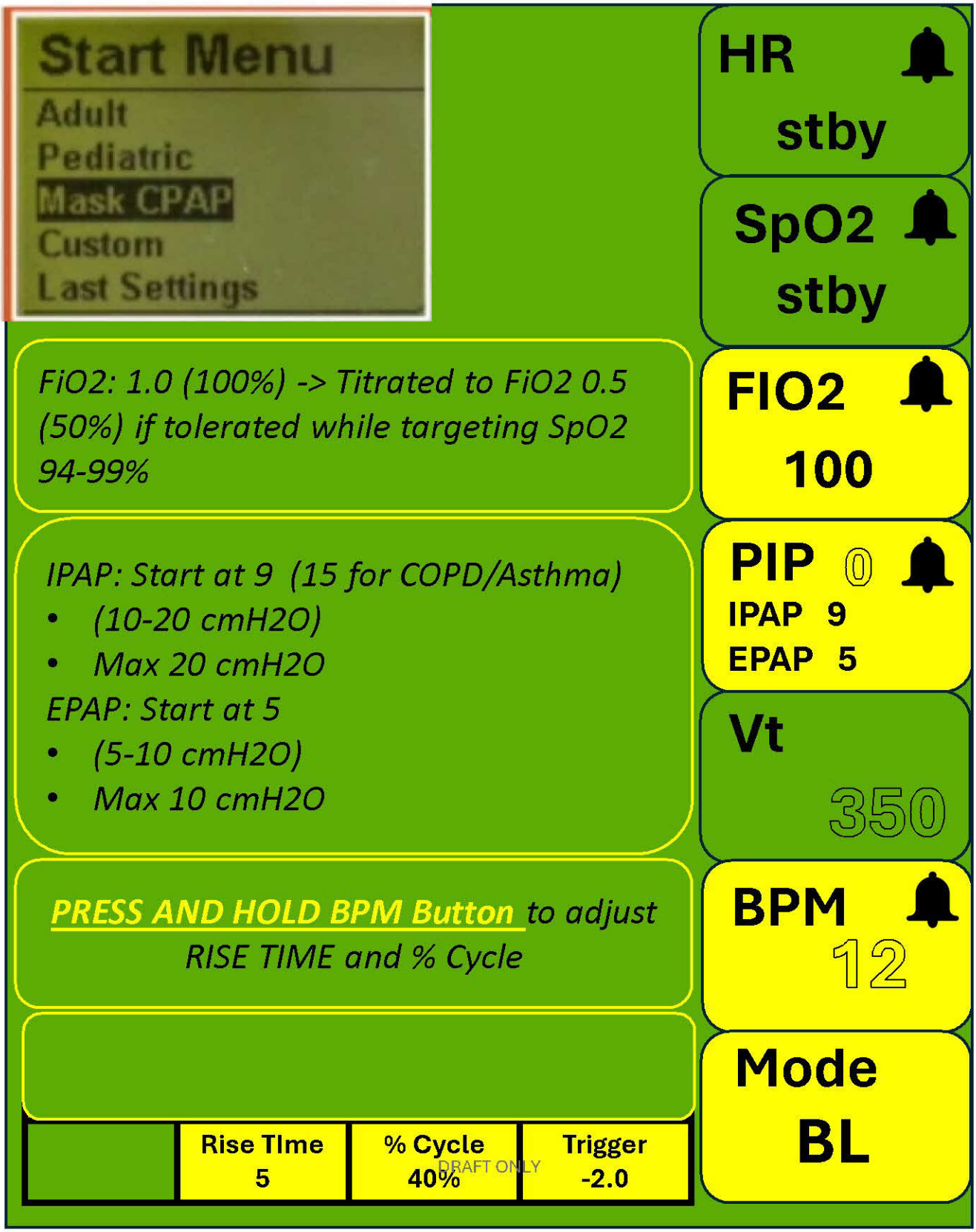
Select **Mask CPAP** in the **Start-up Menu**.
Adjust FIO2 to 100%
Multiple PRESS *and* SELECT the PIP button to set **PEEP LEVEL at 5**.

(PEEP = CPAP in CPAP mode)



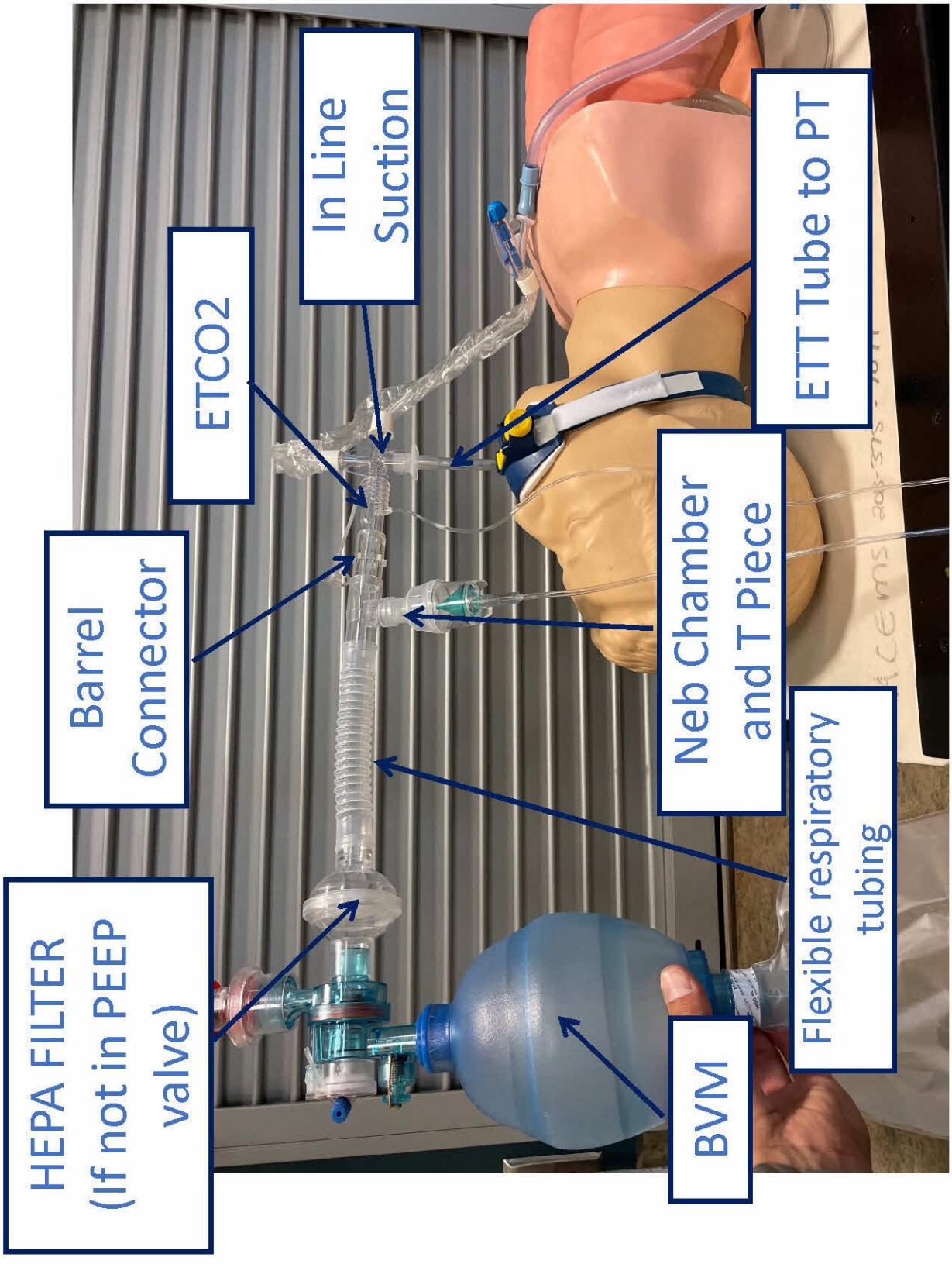
ADULT BiLevel (BiPAP)

Select Mask CPAP in **Start-up Menu.**
PRESS and HOLD MODE button to set **Mode to BL.**
PRESS and HOLD BPM button to setup **Rise Time**, **% Cycle** and **Trigger.**
Begin at **IPAP of 9** and **EPAP of 5**. Once Pt is comfortable with BIPAP increase IPAP/EPAP as needed.
Cycle defaults to 25% (25-40%). This is likely low for many patients. Adjust to 40% for asynchrony , discomfort or tachypnea



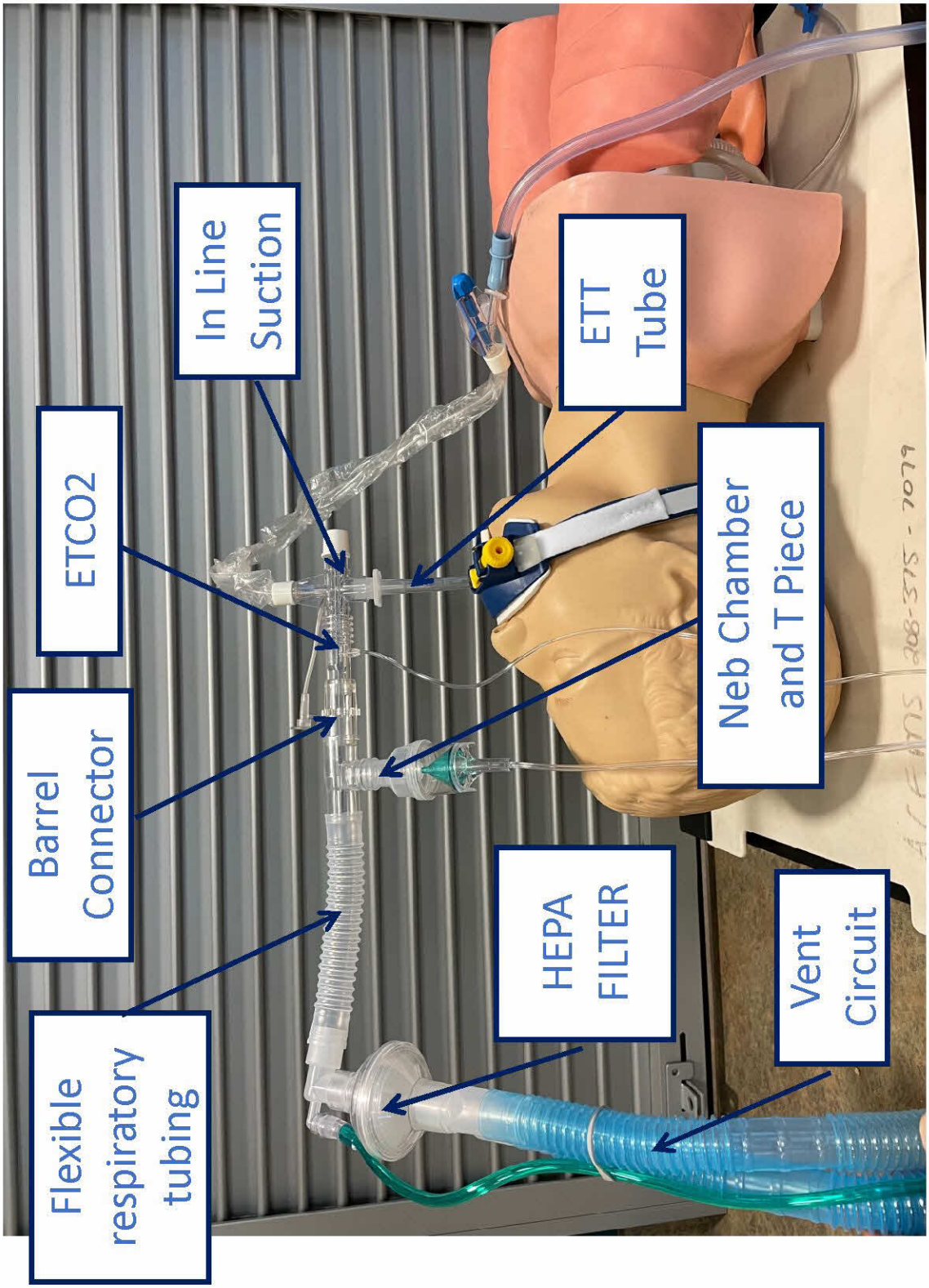
BVM → HEPA → NEB → Barrel Conn. → ETCO2 → In line suction → ETT

Estimated Dead Space 110 ml
(190 ml WITH HEPA FILTER)



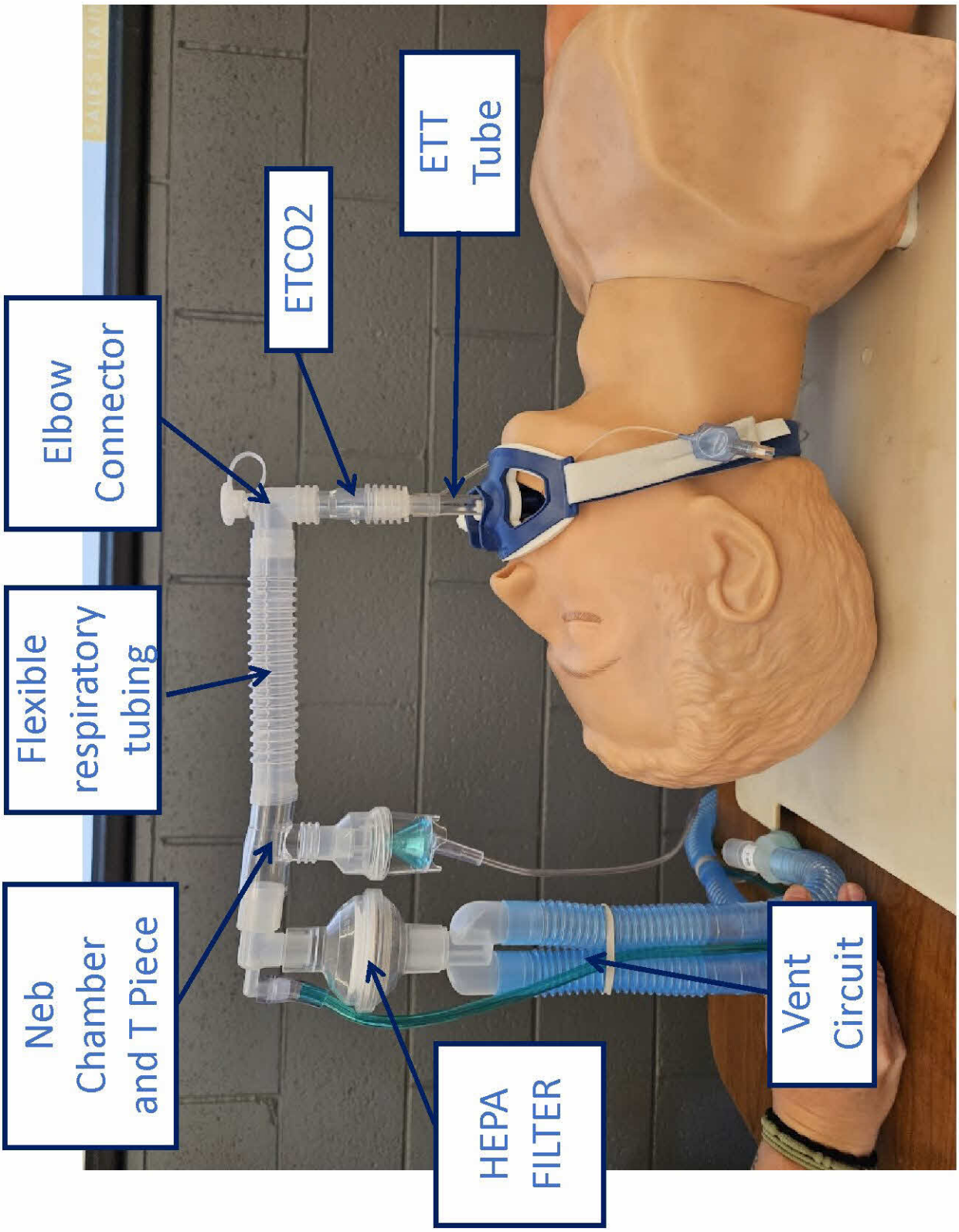
VENT (w/ HEPA) → NEB → Barrel Conn. → ETCO2 → In line suction → ETT

Estimated Dead Space 110 ml

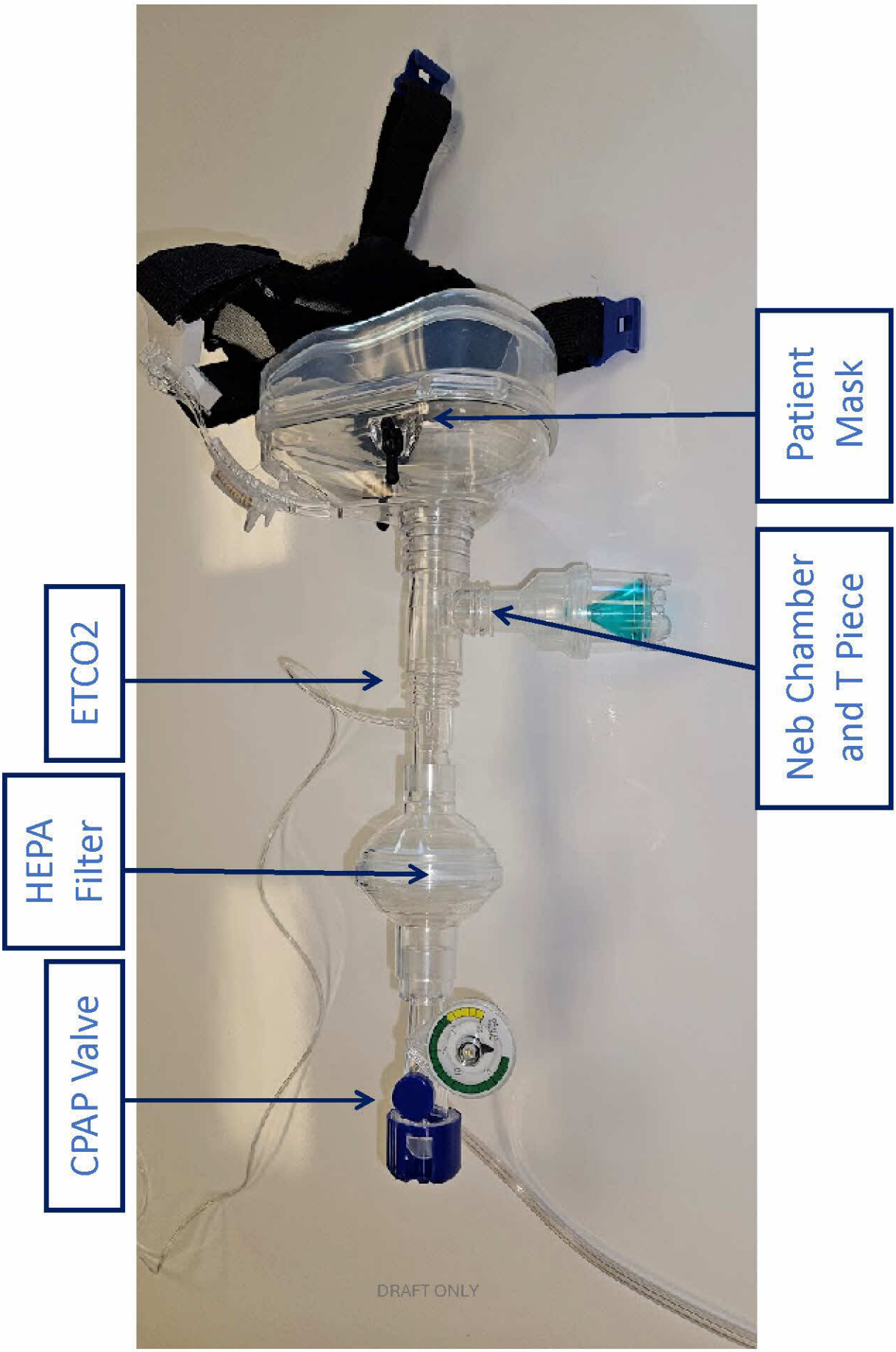


VENT (W/ HEPA) → NEB → Corr. Tubing → Elbow Conn. → ETCO2 → ETT.

Estimated Dead Space 90 ml



CPAP -> HEPA -> ETCO2 -> NEB -> MASK



Dead Space Estimates
(Approximate Volumes)

ETCO2

- Side Stream/in line (Zoll): 10 ML
- Colormetric Adult 20 ml
- Colormetric Pedi 5 ml

LMA

- Size 1- 9 ml
- Size 2- 9 ml
- Size 3- 20 ml
- Size 4- 20 ml

ETT

- 7.0- 10 ml
- 8.0- 12 ml
- 9.0- 15 ml

Nebulizer

- Complete Set Up 100 ml

(T-piece/Corrugated tubing/5 mm Barrel Connector)

- Neb chamber: 20 ml
- Corrugated tubing 50 ml
- T-piece 20 ml
- 5 mm Barrel Connector: 10 ml

Misc.

- HEPA VIRAL/BACTERIAL Filter 80 ML
- Elbow Connector 10 ml
- In Line Steri-Suction 10 ML

ACCESS System

OM/ Peer to Peer Skills Check Off Sheet

Ventilator: Zoll Z Vent/EMV+

Peer: _____ Assisted BY: (Optional): _____ Evaluated by Peer: _____

Date: _____ Time: _____ ☐ Scenario demonstration ☐ Skills Station

TASK: Properly apply the *Z Vent* with HEPA filter, in line suction, and ETCO2 to a simulated apneic patient with an advanced airway. *This skill may be evaluated as part of a larger patient care scenario or separately as a skill station.*			
PERFORMANCE OUTCOME: The provider shall properly assess the patient, determine indications, r/o exclusions, and subsequently apply mechanical ventilation to a simulated patient using the *Z Vent* ventilator and CPAP mask system.			
CONDITIONS: Given proper administration equipment (E600 ventilator, circuit, O2 source, Mask, Harness, Simulated patient), the candidate shall demonstrate the ability to:			
Task	**NO**	**Prompted**	**Yes**
Verbalizes the indications for the ventilator. (See protocol)			
Verbalizes the documentation requirements for ventilator use. (See protocol) (i.e. Mode, Tidal Volume, Minute Volume, Resp Rate, Peep, I:E ratio, documented in the chart)			
Verbalizes contraindications to use of the ventilator. (See protocol)			
Selects the appropriate Circuit (Based on the scenario), attaches it to the ventilator correctly, and attaches HEPA filter appropriately			
Properly conducts an "Operator Test" and "Daily Test" with the "Test Circuit". - ***See Vent reference book and/or operator manual***			
Verbalizes that they would set all initial settings before connecting the patient to the ventilator by using the "test lung" to visually confirm proper function.			
Adjusts initial settings for the simulated patient (See protocol): Mode, Vt, BPM, I:E, FIO2, PEEP			
Appropriately connects the "test lung" and visually confirms the correct operation of the ventilator.			
Given a simulated patient, the provider can (*or demonstrates in scenario*):			
Sets/confirms **mode** to AC(v) or SIMV (v) (*"Please set mode to ____"*)			
Selects appropriate **tidal volume** based on predicted body weight. (*"Please adjust tidal volume based on height of ____"*)			
Selects and adjusts **I:E** ratio from 1:3.0 to 1:4 and back to 1:3.0 (*"Please adjust the I:E ratio to ____"*)			
Selects and Adjusts the **Ventilation rate (BPM)** from 10 to 6 and back. (*"Please adjust the ventilatory rate to ____"*)			
Selects and adjusts the **FiO2/Percentage** of O2 to 21% and back to 100% (*"Please adjust the O2 concentration to ____"*) * *May simulate if not using O2*			
Selects and Adjusts **PEEP** to 10 cm H2O and back to 0 cm H2O. (*"Please adjust the PEEP to ____"*)			
Selects and Adjusts **PIP ALARM to 100 and then back.** (*"Please adjust the your PIP alarm to ____"*)			
Delivers a "manual" ventilation via the ventilator (*"Please deliver a single manual ventilation using the ventilator"*)			
Confirms P-PLAT is < 30 mm HG (*"Please confirm the P-Plat"*)			
Attaches in line suction/ETCO2 and/or other attachments appropriately			
Verbalizes D.O.P.E.S. (See Protocol) *Displacement, Obstruction, Pneumothorax, Equipment, Stacked Breaths*			
Verbalizes monitoring for Tube position, Pressure alarms and signs of poor sedation.			
Verbalizes the need to ensure that the BVM *with Mask* is within arms reach of the patient at all times			

Demonstrates/verbalizes transition to Low Pressure O2 Source using a BVM, HEPA Filter, and Low Flow (8-10 LPM) O2 source.			
Demonstrates/verbalizes addition of: - In-line suction, - ETCO2 - Calculation/consideration of dead space to Vt			
Knows the steps in how to clean and restock (Returns the pump to "ready" condition in bad, replaces the filter, etc)			

Evaluator Signature: _____

NOTE: The desired time is less than 3 minutes.

CRITICAL CRITERIA (requires restart / re-performance of entire station)

___Did not connect oxygen (may be verbalized)

___ Did not connect perform the "operator test" **PRIOR TO** attaching to the patient.

___ Did set initial settings **PRIOR TO** attaching to the patient.

___ Did not visually confirm operation with a test lung **PRIOR TO** attaching to the patient.

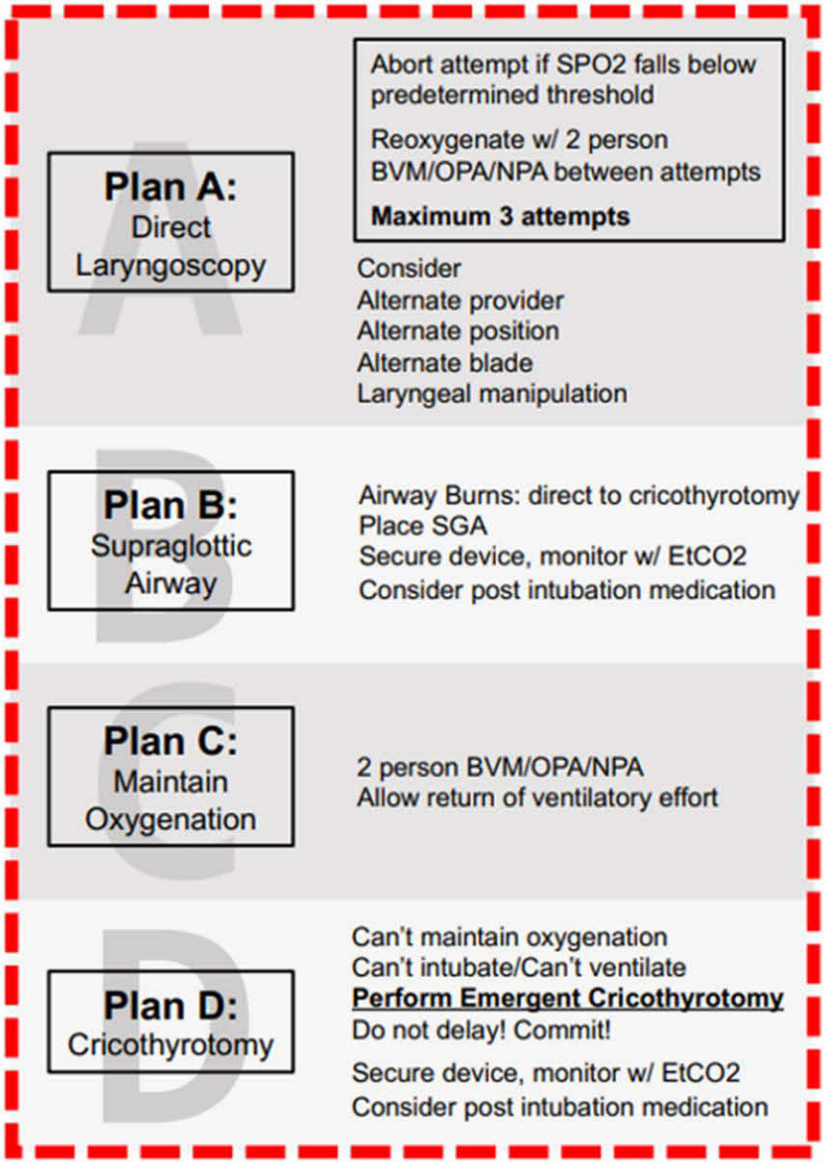
___Did not select appropriate Vt and RESP RATE using IBW chart and patient's clinical condition **PRIOR TO** attaching to the patient.

___Did not ensure that the BVM *with Mask* is within arms reach of the patient at all times

___Did not continuously monitor patient (Tube Position, Pressure alarms, signs of poor sedation.

___Could not verbalize/Perform DOPES (Displacement, Obstruction, Pneumothorax, Stacked Breaths)

Difficult Airway



Modified from DAS Guidelines for Management of Difficult Intubation. See das.uk.com

Minimum Equipment List

- *Oxygen TURNED ON AND CONFIRMED*
- *Suction Device TURNED ON AND CHECKED*
  - *Suction tubing and Decanto Cath attached*
- *BVM with mask ready*
- *Cric Kit out, identified and ready*
- *Laryngoscope – 2 blades*
- *Proper Size Supraglottic Airway and syringe*
- *Zoll ETCO2 Attached and initialized*
- *Back Up EZ-CAP ETCO2 ready*
- *Stethoscope*
- ***Bougie***
- *Appropriate Size ETT and 1 size smaller w/ 10 cc syringe*
- *Tube Holder*
- *Drugs : Paralytic, Sedative/induction agent*
- *Drugs: PUSH DOSE EPI*

Work Space:

Patient Weight:

- Pounds:
- KG:

Ketamine:

- MG:
- CC:

SUCCS/ROC

- MG:
- CC:

Tidal Volume

- CC:

Delayed Sequence Intubation (DSI) Checklist

Preparation

- ☐ Equipment
  - List on reverse side
- ☐ Patient
  - High-flow O2
  - Positioning
  - Assess anatomy
  - Confirm IV access
  - Stabilize patient
- ☐ Assign roles
  - Verbalize plan

STOP: Procedural pause.

Sedation

- ☐ Administer Sedative
  - Dosage below
- ☐ Begin Preoxygenation
  - BVM assist?
  - CPAP?
  - PEEP?
- ☐ SPO2 Timer
  - Preoxygenation
  - Goal of 92%+ for 3 minutes

STOP: Procedural pause.

Paralysis

- ☐ Administer paralytic
  - Dosage below
- ☐ Ensure paralysis
- ☐ Verbalize minimum SPO2 threshold
- ☐ Perform intubation
- ☐ Failed airway flowchart on reverse

Post-intubation

- ☐ Confirm placement
  - Re-confirm continuously and w/ movement
- ☐ EtCO2 waveform capnography
- ☐ Secure tube
- ☐ Ongoing sedation & analgesia

Medications

*consider medication availability/contraindication

Ketamine
1-2 mg/kg

Succinylcholine
1-2 mg/kg
or
Rocuronium
1 mg/kg

Rocuronium……..1 mg/kg

Versed…….0.5-5 mg
PRN max 10 mg

Morphine.....0.1 mg/kg max 10 mg
PRN x10min @ ½ dose total max 20 mg

Fentanyl.....1mcg/kg max 100 mcg
PRN x10 min total max 200 mcg

Push Dose Epinephrine…….2 mL Bolus then 0.5 mL PRN x2-3 min
1 mL "Cardiac Epi" in 9 mL saline flush (0.1 mg in 10 mL → 1:100,000)