USING ANESTHESIA MACHINES AS ICU VENTILATORS

Key points from Drager, ASA-APSF guidelines

Specific to use at BIDMC

Resources

APSF/ASA

- Guidance on purposing anesthesia machines as ICU ventilators (including a quick reference guide)

https://www.asahq.org/in-the-spotlight/coronavirus-covid-19-information/purposing-anesthesia-machines-for-ventilators

- FAQ on machine use, protection, and decontamination

https://www.apsf.org/faq-on-anesthesia-machine-use-protection-and-decontamination-during-the-covid-19-pandemic/

Resources

- Drager instructions google doc (not formatted)

https://docs.google.com/document/d/1jUy16V-1qIS4-gE-Z6mFgMslkyoebI7dAZk7qNHq1to/edit?usp=sharing

- Formatted letter available on education website

Key points

- Anesthesia machines were not originally designed to be used for long term ventilation
- Use as an ICU ventilator will require increasing the typical gas flows
  - Prevent rebreathing
  - Optimize efficiency in high MV scenarios
- Scavenging
  - If not using the inhaled anesthetics – not necessary
  - If performing volatile sedation – necessary
- Contamination
  - Use of HME filter plus antiviral filter should be effective
  - Should not need to decontaminate internal components
- Circuits and components should be checked frequently for moisture and secretion build up
- Device testing should still occur q24hrs, but can be extended to q72hrs if clinically indicated

Use higher gas flows

- Lower FGF typically used in the OR is done to facilitate conservation of anesthetics through rebreathing
- Rebreathing is not a desirable feature in the critically ill COVID patient
  - Hypercarbia
  - Lower FiO2 than intended
  - Excess condensation
  - Exhaustion of CO2 absorbent

- If FGF exceeds minute volume, little to no rebreathing occurs

- Drager recommends using FGF 150% of MV
- ASA/APSF suggests at least 100% of MV

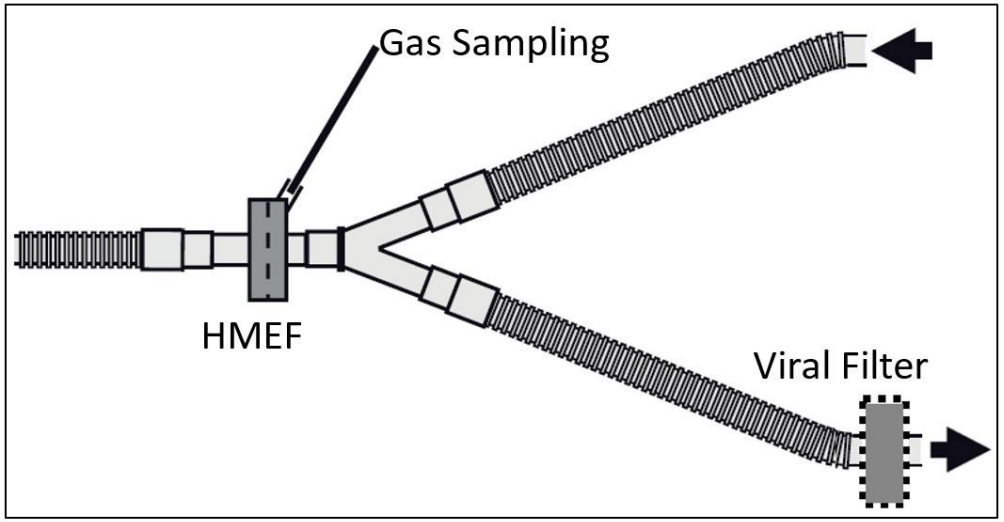
- Use a 3L breathing bag to prevent reservoir depletion

Scavenging

- Not required if not using the volatile anesthetics
  - CO_2 absorbent still recommended
- Required if performing volatile anesthetic sedation
- Scavenging can be performed as usual in the OR
- For outside of OR locations (PACU), an adapter to connect the scavenging exhaust to the hospital wall suction is required
  - For more information, contact Ed Plant (eplant@bidmc.harvard.edu)

Prevention of Contamination

- Use both an HME (Y piece) and a viral filter (Expiratory limb)
- Gas sampling attached on the machine side of the HME filter



Preferred Filter Configuration

VFE > 99.99% for each filter. Gas sampling on machine side of filter. (Courtesy Draeger Medical)

Humidification

- Use HME filter
- Active humidification not recommended

- Machine/circuit needs to be checked regularly for excessive condensation/secretions
  - Water trap
  - Circuit
  - HME

Suggested Maintenance

MONITORING SCHEDULE (Record manually time and value if EMR not connected to machine)

Task	Continuous	Hourly	q 4 hours	q 24 hours
Alarms	X			
CO2 Absorbent		X		
Monitored Parameters • Insp Oxygen • Insp and Exp CO2 • Insp Pressure • Tidal Volume • Spirometry • *Agent concentration*		X		
Inspect for humidity and secretions • Filters • Water trap		X		
Check Vap Fill if Sedating				
Change Filter/HME			X	
Increase FGF to MV or above for 15 minutes			X	
Perform Self Test*				X

*Anesthesia machine WILL NOT provide ventilation during the self-test. An alternate ventilation strategy that can several minutes is required. Consider transport ventilator if manual ventilation bag not likely to be successful. Power to the machine should be cycled between every patient and at least every 25 days.

Volatile Anesthetic Sedation

- Not generally recommended, especially in areas not managed by an anesthesia provider
- Can be considered in the event of a shortage of alternative sedatives (Propofol, Midazolam)
- Should have an anesthesia provider available 24/7 for troubleshooting
- Requires absorbent and scavenging

- See additional guidelines on anesthesia education website