EDUCATIONAL GUIDE

Astral Ventilator

Astral Ventilator Instruction Manual

Astral Ventilator Training Video

General Information

- The Astral Ventilator is a machine that helps people breathe when they have trouble breathing on their own. It's often used by people who have a trach (a tube in their neck) or other breathing problems.
- The ventilator pushes air into the person's lungs to help them breathe. It's small and can be used at home or in the hospital. The ventilator has a screen that shows important things like how much air the person is getting and how many breaths they are taking.
- The Astral Ventilator can be set to different settings depending on what the person needs to breathe comfortably. It helps by giving extra air or helping them take each breath.
- Caregivers help by making sure the machine is working right, checking for alarms, and making sure the person is getting the right amount of air.
- **Ventilator Settings**: Write down the settings the doctor or respiratory therapist gives you for your child.
- **Oxygen Needs**: Make sure you know if your child needs extra oxygen and how to connect it to the ventilator.

Make sure the oxygen is connected correctly to the ventilator. Before you leave home, always check that the oxygen tank is full. When you go to a medical appointment, connect to the oxygen in the room to save the oxygen in the portable tank.

Ventilator Components:

1. **Adapter Port:** This is where you can attach different types of tubes to the ventilator. You may have a single tube adapter, a single tube with a leak adapter, or a double tube adapter (only on the Astral 150 model).

2. **Handle:** The handle makes it easier to carry the ventilator from one place to another.

3. **Inspiratory Port (to patient):** This is the part where the air goes out and into the person's trach. It helps deliver air to the person so they can breathe. On the Astral 150**,** there's a special FiO2 sensor that checks how much oxygen the person is getting. This sensor is only available on the Astral 150 and is optional on the Astral 100**.**

4. **Ethernet Connector:** This is a connection used only by service workers to check or fix the ventilator.

5. **USB Connector:** This is used to connect the ventilator to a computer to get important information or connect special accessories.

6. **Mini USB Connector:** This is used to connect the ventilator to another special machine to track or monitor it.

7. **DC Power Inlet:** This is where the ventilator gets its power, either by plugging in a battery or charger.

8. **On/Off Button:** This button turns the ventilator on and off.

9. **SpO2 Sensor Connector:** This is where you plug in a sensor that checks how much oxygen is in the person's blood.

10. **Remove Alarm Five Pin Connector:** This connects to the alarm system at the hospital.

11. **Low Flow Oxygen Input:** This is where you can connect extra oxygen for the ventilator (per the manufacturer it can go up to 30 liters per minute)

12. **Air Inlet:** This part pulls in air from the room and has a filter to make sure the air is clean.

Always carry the A/C adapter with you. Plug the ventilator into a power source whenever you can. Make sure to keep the backup lithium battery charged and with you when you leave home. Do not use a power strip. Plug directly into a wall outlet. The DME company will give you a battery pack to use when needed.

Ventilator Screen Display

Information Bar

The Information bar on the screen shows important details like:

- ✅ Battery level (how much power is left)
- ✅ Alarm notifications (if something needs attention)
- ✅ Current settings (how the ventilator is working)

Internal Battery Indicators

100% 70%

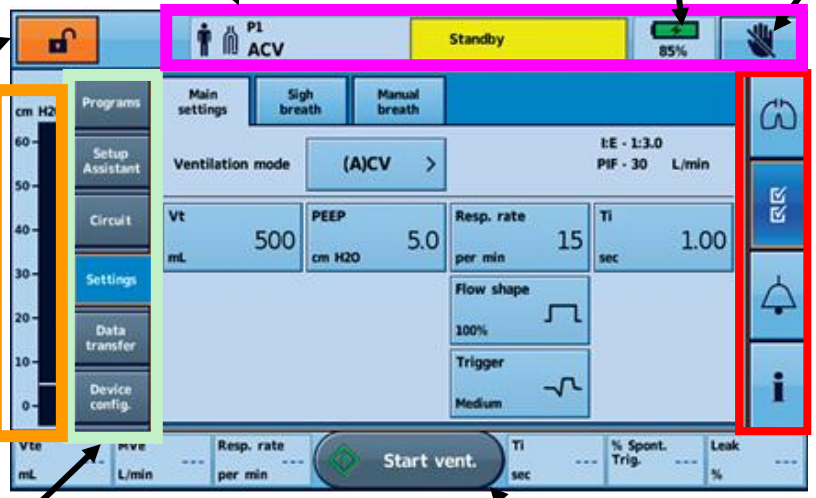
Lock Button 🔒

The lock button keeps the settings safe so they don't get changed by accident. If the screen is locked, you will not be able to press certain buttons.

Clinical Mode

🔒 Locked (Must be locked.)

This button is only used by clinicians. **Do not touch!**



Pressure Bar

The pressure bar shows how much air pressure is being used to push air into the lungs. This helps doctors make sure the patient is getting the right amount of support.

Menu Bar

Sub Menu

The sub menu is like a hidden list of extra options, where you are going to find the option to do a circuit test.

Start/Stop Ventilation

Start Ventilation – This turns the ventilator ON.

Stop Ventilation – This pauses the ventilator. 🚨 Only press this if you are doing a circuit test and someone is bagging the child. The child will not get breaths when it is stopped.

Touch Screen

To use the screen, just tap it anywhere. After that, the screen will tell you what to do next. Just follow the instructions that appear on the screen.

Locking the Touch Screen:

1. On the touch screen, tap  on the information bar to see more details.

2. When the screen is locked, it will have an orange highlight, showing you that you can't change anything.

Starting Ventilation:

1. Press the green on/off button at the back of the device (if power is not already on).
2. Press start vent button 

then ventilation will begin.
3. Add oxygen if required.

Stopping Ventilation:

1. If oxygen is connected, turn it off.
2. Press and hold the button. 

3. Let go of the button 

when the screen asks you to.
4. Press "Confirm" to stop the ventilator.

You can stop the ventilator any time and from any screen.

Set up and Monitoring

Settings:

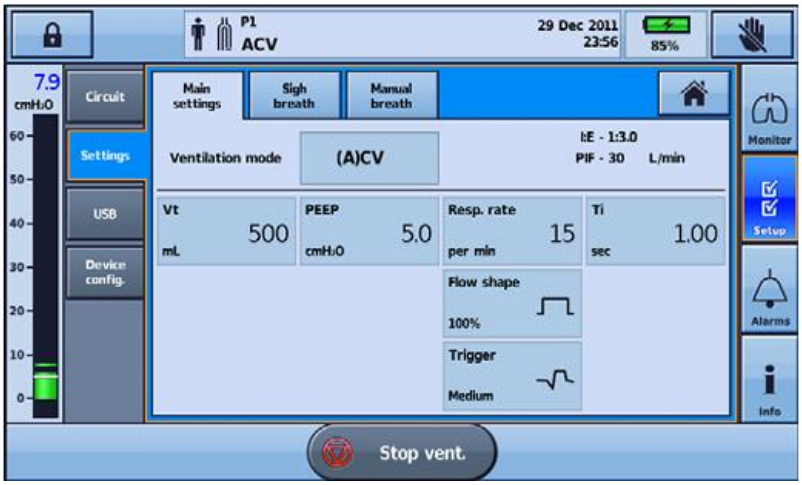
- The ventilator has different settings. Clinicians and respiratory therapists carefully set these to make sure your child is getting the right amount of air and oxygen.

- **How to verify settings:**
  - The doctor will order the settings based on your child's needs and program the settings into the ventilator.

How to get to settings:

Menu bar → click on setup 

→ click on "settings" on sub menu



Take a picture of the ventilator settings once you are home so you can remember them. Keep a copy of the settings and your child's respiratory treatment in the travel bag just in case you need it when you're not at home.

Monitoring:

On the monitoring screen you will find mode and patient return settings.

How to get to monitoring:

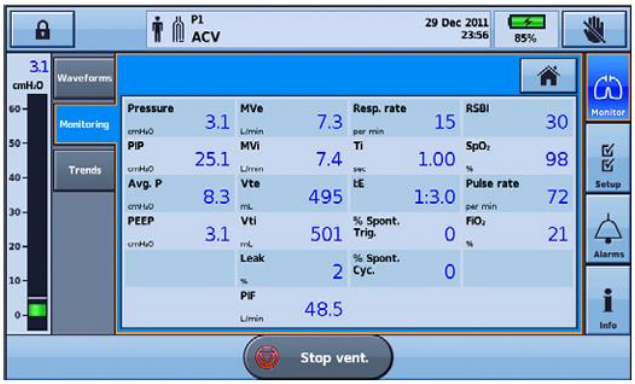
Menu bar → click on monitor 

→ click on "monitoring" on sub menu

1. **Mode**: This decides how much work the ventilator does—sometimes it does all the breathing, and other times it just helps when needed.

PS (Pressure Support):	This mode helps the person breathe by giving them air at a set pressure. The ventilator helps, but the person still does some of the breathing on their own
P-SIMV (Pressure – Synchronized Intermittent Mandatory Ventilation):	The ventilator gives breaths at a set pressure, but also lets the person breathe on their own in between. It's a mix of the machine helping and the person breathing by themselves.
CPAP (Continuous Positive Airway Pressure):	This mode keeps your child's airways open with a constant flow of air. It's often used to help children who have sleep apnea, a condition where breathing is paused for more than 20 seconds during sleep.
V-SIMV (Volume – Synchronized Intermittent Mandatory Ventilation):	This mode delivers breaths using a set amount of air (volume). It also lets the child breathe on their own between breaths, but if they need extra help, the ventilator will give them more breaths.

2. **Return patient parameters**: Return parameter settings on a ventilator are numbers that show how your child is doing and helps doctors adjust the machine if needed. It is important to know your child's settings and return parameters so you can recognize any changes.



Breaths per Minute (BPM):	This tells how many breaths the ventilator is giving and/or the child is taking every minute.
Tidal Volume:	This makes sure the breaths are not too big or too small.
Oxygen Level (FiO_2):	The percentage of oxygen your child is receiving.
Pressure (PEEP – Positive End-Expiratory Pressure):	This keeps the lungs slightly open after breathing out so they don't collapse.
Pressure Support:	This gives extra air when the child tries to take a breath on their own. It's like a boost to make breathing easier.
PIP (Peak Inspiratory Pressure):	This is the highest pressure the ventilator uses to push air into the lungs. If this number is too high, it can mean the lungs are stiff or having trouble expanding.
MAP (Mean Airway Pressure):	This is the average pressure in the lungs throughout the breathing cycle. It helps keep the lungs open and improves oxygen levels.
Inspiratory Time (I-Time):	This is how long each breath lasts when air is going in.
I:E Ratio (Inspiratory to Expiratory Ratio):	This shows how much time is spent breathing in (inhaling) compared to breathing out (exhaling). A normal ratio is around 1:2 or 1:3, meaning exhaling is twice as long as inhaling.

Alarms

Alarms are triggered when something goes wrong or settings are out of range, ensuring patient safety.

Alarm Priority	Alarm bar	Audible Alert
High	Red flashing light	10 beeps every 5 seconds
Medium	Yellow flashing light	3 beeps every 15 seconds
Low	Yellow steady	2 beeps every 25 seconds

Types of Common Alarms:

	Causes	Action
Low Pressure Alarm	The child is not receiving enough air	1. Ensure trach is in place! 2. If applicable, check cuff volume. 3. Check circuit for leaks or kinks. 4. Check all connections and ensure exhalation valve is not covered. 5. Suction child. 6. If something is broken or damaged, replace it. 7. If needed, give manual breaths with an Ambu bag.
High Pressure Alarm	Airway is blocked Resistance in the system Ventilator is pushing too much air	1. Ensure trach is in place! 2. If applicable, check cuff volume. 3. Check circuit for leaks or kinks. 4. Clear any water in the tubing. 5. Check all connections and ensure exhalation valve is not covered. 6. Suction child. 7. If something is broken or damaged, replace it. 8. If needed, give manual breaths with an Ambu bag.
Low/High FiO2	Oxygen levels are outside of the set range.	1. Check that oxygen tubing is connected.

Refer to Astral Manual for other alarms and troubleshooting. Manual can be found using the QR code on page 1 of the handout.

Muting Alarms:

- **Muting the Alarm Temporarily:**

  You can mute the alarm sound for two minutes  . The alarm will still show up on the screen, but it won't make any noise. If the problem isn't fixed in two minutes, the sound will start again.

- **Muting the Alarm Ahead of Time:** 
  You can also mute the alarm before you know it's going to go off. This is useful if you're doing something like suctioning (clearing the airway) or disconnecting the patient from the ventilator for a short time.

Resetting Alarms:

- **Resetting an Alarm:**
  When you resolve the problem and press the reset button, the alarm will go away from the screen and stop making noise or flashing. You should only reset it after you've fixed whatever caused the alarm to go off. If the problem isn't fixed, the alarm will start again.

- **The Ventilator Can Clear Some Alarms Automatically:**
  Sometimes, the ventilator will fix the problem on its own, and the alarm will stop by itself. When this happens, the alarm will disappear from the screen, and the sound will turn off.

- **What Happens After You Reset or Clear an Alarm:**
  Once you reset or clear the alarm, the ventilator will show the next most important alarm if there's one.

Learn Circuit

The learn circuit test is done to make sure the ventilator works correctly before your child uses it. If you have any questions, please contact the home health company.

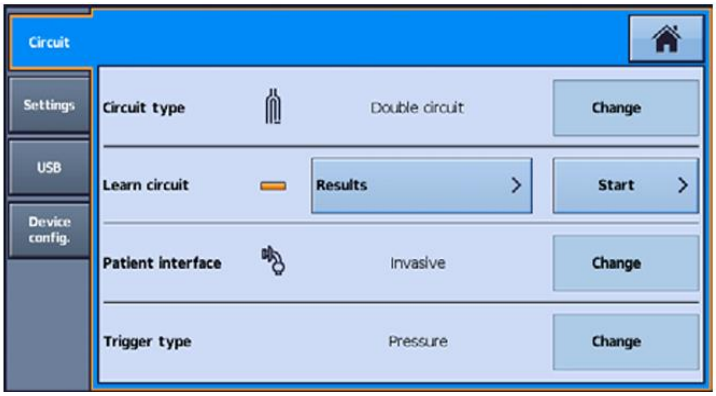
When to Run the Learn Circuit Test:

- **The ventilator is not working correctly:** running a learn circuit can help determine if the tubes (circuit) are working properly

- **For a circuit change:** Every time you replace the tubing, you must do a learn circuit to make sure everything is set up correctly.

How to perform a learn circuit check:

Menu bar → click on setup → click "circuit" on sub menu → disconnect patient from ventilator and start maintenance bagging → put ventilator in standby → press start.



Learn Circuit Test Steps:

1. Device Test: Follow the screen prompts and then hit continue.

2. Circuit Resistance: Follow the screen prompts (ensure the exhalation valve is removed) and then hit continue. DO NOT block the end of the circuit.

3. Circuit Compliance: Follow the screen prompts and hit continue. BLOCK the circuit tubing.

- Once the test is complete, the screen will show the test results. If you need to reference the test results later: go to the menu bar→ click on setup → click "circuit" on the sub menu → press the "results" button.

What to do if the Learn Circuit Test Fails:

- 🔄 'Try running the test again.
- 📞 If it still doesn't work, call the Durable Medical Equipment (DME) company for help.

Bypassing the Heater

Turn the heater off.

Disconnect the yellow and blue wires located on the side of heater and allow them to hang down.

Disconnect the long circuit tubing located at the heater.

Remove short circuit tubing from bacterial filter.

Attach long circuit tubing to the bacterial filter.

The short tubing that was disconnected from the bacterial filter can be connected to the water chamber at the heater creating a loop. This will keep dust and debris out of the water chamber.

Never remove the temperature probes from the circuit as this will cause a large leak and a high priority alarm or introduce bacteria to the circuit.

Traveling with Ventilator

If you are taking the Astral ventilator with you while traveling, here are some important things to remember:

- Bring your child's second back up ventilator.
- 👜 Use the Carry Bag – Always keep the Astral device in its special carry bag when you're not using it. This helps protect it from getting damaged.
- ✈️ Carry-On Only! – The Astral device must stay with you in your carry-on bag. Do **NOT** put it in checked luggage because the bag won't protect it well enough.
- 🔎 Going Through Security **–** Security might ask questions about the device. To make things easier, keep a printed copy of the manufacturer manual in the carry bag. If needed, show security the guide so they understand what the device is for.

By following these steps, you can keep the Astral device safe and ready to use while traveling!

Frequently Asked Questions:

- **Q: What if the ventilator isn't working right?**
  A: Place patient on backup ventilator. Then call DME. If both ventilators are not working, bag patient. If it is an emergency, call 911.
- **Q: Do I get sterile water at home?**
  A: At home you might have to buy your own water. Use distilled/sterile water only for ventilator heater.
- **Q: How many ventilator circuits do I get?**
  A: You might only get two ventilator circuits per month at home.
- **Q: Do I get a vent-stand at home?**
  A: Most DME companies will provide a ventilator stand.
- **Q: What if the heater stops working?**
  A: Call the DME company and use HME.

Resources

- ResMed confirms that the Astral device meets the Federal Aviation Administration (FAA) requirements (RTCA/DO-160, section 21, category M) for all phases of air travel.

- *Resources: Astral Ventilator Manual*

POLICY: BiPAP/CPAP Non-Invasive Positive Pressure Ventilation (NPPV)

SCOPE: Managing Acute Respiratory Insufficiency/Failure

POLICY:

For the non-invasive positive pressure ventilation (NPPV) management of spontaneously breathing patients/residents in need of additional respiratory support. The Respiratory Care Practitioner (RCP) will utilize the following protocol to identify a candidate for NPPV and select the ventilation assistive device and type of interface to effectively manage the patient/resident.

EQUIPMENT NEEDED:

1. Stethoscope
2. Ventilation Assistive device:
    a. Philips-Respironics Trilogy 202 and EV 300 Ventilator
    b. Astral 150
    c. Respironics CPAP (Home Care)
    d. Vyaire LTV Ventilator 3. Interface device:
    a. Nasal Mask
    b. Nasal Prongs
    c. Full Face Mask
    d. RAM Cannula (for infants < 10 kgs)
4. MR850 Heated Humidifier

PROCEDURE:

NPPV shall be instituted upon a written order and/or verbal order from a physician. The order should include the oxygen concentration to be delivered. The following are indications for NPPV:

1. Spontaneously Breathing Patient/Resident.

2. Mild respiratory distress which is manifested by:
    a. Tachypnea without signs of distress (high respiratory rate 20 above patient/resident's normal).
    b. Tachypnea with mild retractions, shallow breathing and/or minor infrequent periods of apnea.
    c. SpO2 <90%
3. **Note:** Those patients/residents exhibiting any of the following criteria will be excluded from NPPV and an Alternate Therapy must be chosen:
    a. Respiratory Arrest
    b. Uncontrolled Arrhythmias
    c. Airway Obstruction
    d. Unable to clear secretions
    e. Uncooperative patients
    f. Facial Trauma
4. Initiate NPPV by selecting the appropriate Ventilation Assistive device and correctly sized Type of Interface.
    a. Nasal Mask and Nasal Prongs: appropriate for facial abnormalities, long term NPPV.
    b. Full Face Mask: appropriate for mouth breather, anxiety and long term NPPV.
    c. RAM Cannula: appropriate for infants < 10 kg.

    d. A mask that is improperly fitted to the patient/resident will cause anxiety or discomfort and will only impede the effective management of the patient/resident.
5. Obtain initial orders/settings for NPPV and verify patient/resident's order in the Electronic Medical Record (EMR) for specific instructions. Proceed to the patient/resident's bed, introduce yourself. Check the patient/resident's identification band and explain what you are about to do.
6. Set NPPV alarms to appropriate levels.
7. Continue to monitor patient/resident's respiratory parameter and perform clinical assessments:
    a. Assess patient/resident's level of dyspnea, accessory muscle usage and respiratory rate.
    b. Assess patient/resident's mental status.
    c. Chest auscultation to determine adequate breath sounds and bilateral air movement.
    d. Assess patient/resident for cough effectiveness to promote airway clearance.
    e. Assess secretions (frequency, amount, color and texture).
    f. Optimize medical management of patient/resident.
    g. Monitor patient/resident comfort.

COMPLICATIONS OF NPPV:

Complications that have been noted in seriously ill patients/residents:

1. Rising CO2.
2. Decrease in cardiac output secondary to a drop in venous blood return. This rarely occurs unless there is a drop in blood volume.
3. Drop in arterial blood pressure secondary to #2.
4. Facial skin breakdown from masks.

MAINTENANCE:

The following are items that shall be checked Q6h as per the BiPAP/CPAP flowsheet and documented in the EMR.

1. Check the position of the mask or prongs in the nares for breakdown.
2. Check the corrugated tubes do not contain any condensation and drain as needed.
3. Verify twice per shift and monitor Oxygen concentrations.
4. Suction nares as necessary.
5. Note heartrate and SaO2 via pulse oximeter.
6. Change NPPV circuit and mask/prongs Q28 days and PRN.

CONTRAINDICATIONS:

1. Frequent apnea with a duration of 20 seconds or greater.
2. Bradycardia or severe cyanosis.
3. Clinical evidence of fatigue.
4. SaO2 of 60% or less with FIO2 of 100%.
5. O2 saturation of 85% or less with and FIO2 of 100%.
6. Severe labored breathing.

SETUP AND MONITORING: The Respiratory Care Department shall be responsible for the setup, monitoring and troubleshooting of all equipment.

DISCONTINUATION OF NPPV: NPPV should be discontinued when:

1. Clinical improvement is noted, such as respiratory rate returning to patient/resident's normal rate. Cessation of mild retractions or labored breathing.
2. Improvement in SpO2 with a lowering of FiO2.

POLICY: Bubble CPAP

SCOPE:

The Fisher & Paykel Bubble CPAP (Continuous Positive Airway Pressure) System is intended to provide CPAP to spontaneously breathing neonates and infants who require breathing support due to conditions associated with prematurity or other conditions where CPAP is prescribed by a physician. The intended population is premature and full-term neonates up to a weight of 10 kg.

PURPOSE:

Establish guidelines for the safe institution, set-up and maintenance of Continuous Positive Airway Pressure via Bubble CPAP.

INDICATIONS:

Indications for Bubble CPAP therapy include:

- Respiratory Distress
- Apnea of Prematurity
- Transient Tachypnea of the newborn
- Atelectasis
- Meconium Aspiration
- Bronchopulmonary Dysplasia
- Tracheomalacia
- Cardiogenic Pulmonary Edema

CONTRAINDICATIONS:

Contraindications for Bubble CPAP therapy include:

- Increased mean airway pressure.
- Frequent apneic episodes with desaturation and bradycardia.
- Ventilatory failure.
- Untreated diaphragmatic hernia.
- Increased airway secretions.
- Congenital or abnormal facial malformations where nasal prongs are contraindicated.
- Nasal trauma or severe deformities that might be exacerbated by the use of nasal prongs or masks.

POLICY and PROCEDURE

1. Verify physician order and assess for appropriateness.
2. Obtain appropriate equipment and supplies.
3. Review medical record for precautions or complications.
4. Implement standard precautions
5. Introduce self and identify department
6. Provide patient privacy
7. Correctly identify patient using two patient identifiers (wristband and date of birth)
8. Explain procedure to patient and provides patient/family with education and confirm understanding.
9. Connect the Bubble CPAP unit to both compressed air and oxygen gas system.
10. Set up the Bubble CPAP tubing with pressure manifold and humidification setup.
11. Add sterile nag tp the humidification system. Water bag must be placed higher than the humidification chamber.
12. Add sterile water to the CPAP generator.
13. Fill the CPAP generator with sterile water until water flows into the overflow container.
14. Ensure that the humidifier and Bubble CPAP generator are mounted below the patient.
15. Set the CPAP probe to 10 cmH20 for leak test. Set input flow rate to 1 L/min, Gentle audible bubbling is acceptable, no bubbling means unacceptable leakage. If no bubbling is observed check entire system for possible leaks.
16. Set CPAP level as prescribed by physician
17. Adjust device to desired oxygen percentage via the blender.
18. Adjust the flow rate to the prescribe input flow rate. Recommended 6-8 L/min. Allowable range of 4-15 L/min.
19. Ensure the CPAP, flow rate and oxygen level are as prescribed by physician.
20. Choose appropriate size interface.
21. Connect Bubble CPAP circuit to infant interface.
22. Set the humidifier to invasive mode, ensure there is air flow present before turning on the humidifier.

23. Attach interface to patient. Moisten nasal prongs with sterile water or saline, then place prongs curved side down directed into nasal cavities. **DO NOT USE OIL OR CREAM-BASED LUBRICANT.**

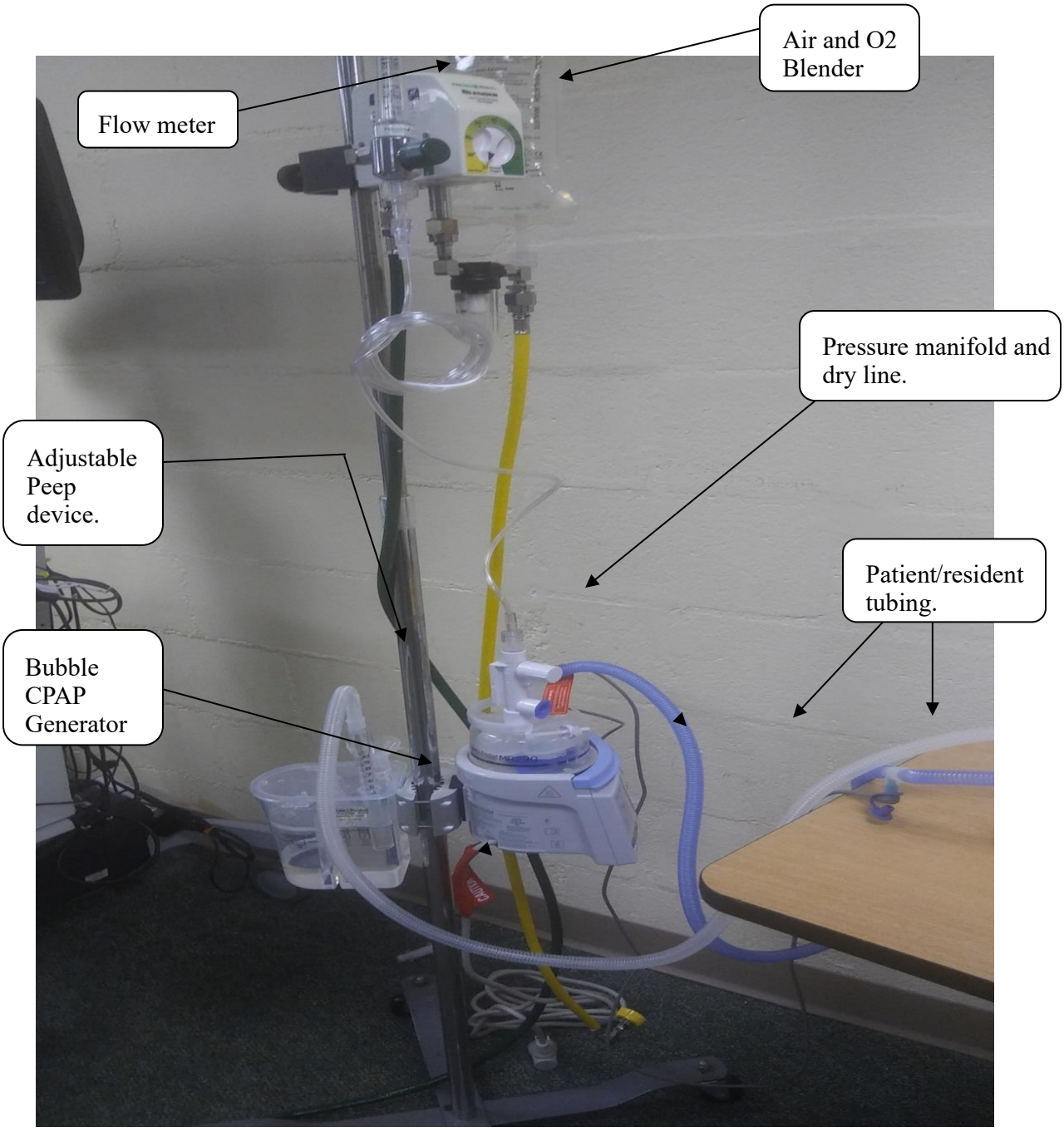
PATIENT MONITORING AND ASSESSMENT

1. Evaluate patients' physiologic response to therapy (Skin color, vital signs, lung sounds, signs of respiratory distress etc.)
2. Bubble CPAP documentation should be done Q6 hours.
3. Assess nares and nasal septum for breakdown during assessments.
4. Regularly observe that water is feeding into the humidification chamber.
5. Should the water level exceed the maximum level marked on the humidification chamber, the chamber should be replaced.
6. Check that all connections are tight after any adjustments
7. Regularly observe the circuit for condensate.
8. Regularly observe the CPAP generator for bubbling.
9. Regularly observe the water level in the CPAP generator and overflow container. Refill the CPAP generator if the water level drops below the minimum water level line.
10. Check and empty the overflow container as needed.

REFRENCES

1. F. A. P. H. (n.d.). *Bubble CPAP System User Instructions*. Retrieved January 9, 2025, from https://www.fphcare.com/us/

ATTACHMENTS:


Air and O2 Blender
Flow meter
Pressure manifold and dry line.
Adjustable Peep device.
Patient/resident tubing.
Bubble CPAP Generator

POLICY: Communication Hand-Off, Sign-Off

POLICY

There are several disciplines involved in a patient's/resident's care every day. Communication between and among these disciplines is critical to patient safety, reduction in clinical errors, and continuity of care.

Formal sign-out or hand-off communication is required at particular points in the continuum of care including but not limited to:

1. **Physician/Nurse Practitioner sign-off**
   Pediatricians/NP sign off to the on call pediatrician who covers the in-patient units overnight and on the weekends. These sign-outs are both written and verbal. There is a written sign-out sheet for all in-patients that is handed-off to the covering provider. In addition, a verbal sign-out highlights problems and necessary follow-ups and is given to the physician coming on duty. That physician likewise signs out to the pediatrician or nurse practitioner prior to going off duty at the end of the shift.

2. **Communication between the inpatient units and outside institutions for clinic visits** An evaluation form is completed by the requesting provider and sent to all clinic visits which occur at outside institutions. The form should be completed by the examining provider and sent back with the patient. If the form is not returned, a follow-up phone call is made by the referring provider within 24 hours of the visit and documented in the medical record.

3. **Sending a patient for an outside test**
   The referring provider completes an evaluation form. A preliminary report should be sent back within 24 hours of the test. If no preliminary report is made, a follow-up phone call is made to the institution, which performed the test within 24 hours. In the Day Hospital, parents are asked to keep us informed of any outside medical visits so that we may make a record of these in the chart.

4. **Communication with instructions regarding admissions and inter-institutional transfers**
   Prior to admission, a written discharge summary or other current medical referral material is received from the referring institution. A verbal sign out, provider to provider, will occur prior to transfer. Telephone follow-up back to the referring institution is made by the case manager. Nurse to nurse report is given over the telephone. In addition, the referring hospital is informed of pending discharges and a copy of the discharge summary sent back to that institution.

6. **Formal "hand-off" reports are also conducted by nursing and Respiratory Therapists (RT). These occur at change of shift as well as other times during the shift when all or part of a patient's care is being transferred to another staff member**.
   All such communication is standardized and includes an opportunity to ask and respond to questions from one caregiver to another. The EHR and status board are used at the time of shift report. It serves as a guide by which to report the significant aspects of the patient's care and clinical condition.

The procedure for communicating patient information includes:

1. A full report on patient status and care requirements are given to the oncoming individual care provider (RN, RT, LPN or NA) who is caring for the child and family by the off going care provider.

2. The elements of hand-off included in the hand-off report are: patient's status history, and background, Respiratory assessment ,safety concerns, timing of meds, therapy, cares etc., future considerations or possible concerns, identification of caregivers, and bedside check with personnel introduction to caregivers

3. The outgoing shift of both nurses, RT's and nursing assistants do not leave until all questions have been answered, hand off report is complete and all EMR documentation is completed..

4. All RT's will assign patients/residents under their care onto their VOALTE ONE phone at the start of their shift. At the end of an RT's shift, ALL VOALTE ONE phones will be returned to the docking station once **all** patients/residents have been assigned to the new oncoming RT VOALTE ONE phone at the start of the next shift.

5. Any time an RN, RT, LPN or NA leaves the unit for an extended period of time, he/she will report off to another RN, RT, LPN or NA, who will provide coverage for the patient in his/her absence. Additionally, they will take possession of their alarm responding system. Except in an emergency, a brief report is given back to the assigned nurse on his/her return.

POLICY: DeVilbiss Suction Device

PURPOSE: Portable suction is used to clear a patient's airway to remove mucus, maintain a patent airway, and avoid airway dislodgement and tracheostomy tube blockages. The frequency of suctioning varies and is based on individual patient assessment.

POLICY: The portable suction devices will be stored in a designated area on each unit, After each use, the clinician that obtained the portable suction device, must wipe down device with a disinfectant wipe and place the device into a soiled utility room. All device disposables must be removed according to our organizational infection control practices. The Medical Equipment Technician is responsible for rounding on all soiled utility rooms, perform final disinfection process and returning devices to designated area. The DeVilbiss suction unit should not be used for thoracic drainage or nasogastric suction.

When preparing portable suction for transport the clinician accompanying the patient will obtain the portable suction device. Suction devices stored on crash carts will be inspected for functionality by nursing. Bacterial filters will be replaced after each patient use.
Parents/Guardians/Caregivers that have been deemed competent by clinical staff (RT or RN) to independently use the suction device may have an assigned portable suction at bedside. Prior to leaving their room, a safety and functionality check must be performed by a Respiratory Therapist or Registered Nurse.

EQUIPMENT:

1. DeVilbiss 7305 suction unit
2. Suction canister with tubing and bacterial filter
3. Suction catheters

DEVICE OPERATION:

After the unit is assembled the device has LED lights that indicate readiness for use.

- L1- Green– External power supplied to unit from AC power source or DC cord. Illuminated when external power is supplied.

- L2 - Yellow– Battery is being charged. Light will go out when battery is fully charged. (7305P Series only)
- L3 - Red– Low battery. Seek another power source and charge battery as soon as possible when light remains on continuous. (7305P Series only)

AC Operation – Plug the small connector of the AC adapter into the DC power input located on the side of the unit. Plug the AC end into a grounded wall-outlet power source. After assembly the device is trialed as a peruse check and set for appropriate suction levels, based on the appropriate suction pressures for the patient's size.

CLEANING AND MAINTENANCE (AFTER EACH PATIENT USE):

1. Shut off unit using power switch and allow vacuum to drop.

2. Disconnect power source from the D/C input receptacle on the unit.
3. Disconnect tubing and remove container from holder and properly dispose of items.
4. Remove all disposable items – all tubing, bacterial filter and canister.
5. Wipe down suction unit with infection control approved disinfectant wipe.

REFERENCES:

Lamb, B BS, RRT, CPFT, FAARC; Patient Safety and the Hazards of Suctioning. Mar 2014. American Association for Respiratory Care, AARC website http://www.aarc.org/webcasts/patient-safety-hazards-suctioning/

AARC Clinical Practice Guideline Nasotracheal Suctioning—2004 Revision & Update research_in_focus_appendix_summary_of_the_aarc_clinical_practice_guidelines.pdfhttp://www.devilbisshealthcare.com/files/A-704_Rev_Q-FINAL.pdf

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Operator can:

- Locate on/off switch on the front of the ventilator
- Locate front cover and battery: 8.5-9 hours when fully charged
- Review gas delivery and turbine functionality (does not require medical air source)
- Locate the following keys: alarm silence, nebulizer, inspiratory hold/manual breath, oxygen enrichment, nebulizer, screen lock/unlock, and the press-and-turn knob
- Locate the following connections: (Right Side) Inspiratory valve, expiratory valve, flow sensor, and nebulizer (Left Side) High Pressure O2, Low Pressure O2, and AC power cord

Initial set up:

- To switch on, press the “Power On” button. Ventilator will go through startup verification process and enter Standby Mode
- Identify inspiratory port, Expiratory port, and color-coded flow sensor connection
- Place expiratory valve into expiratory valve housing
- Attach inspiratory limb, expiratory limb, and flow sensor
- Select “Pre-op Check” to directly access leak test, flow sensor and O2 Sensor Calibration. Perform Leak test and calibrate Flow Sensor; only complete O2 sensor calibration if prompted.
- Press System Tab or “X” to close screen and return to Standby menu
- Input patient gender and height (Female, 5’5”= 65” or 165cm)
- Select mode (PCV) from standby screen using touch screen by selecting “Modes” on the top right or touching the current mode in the top left. Adjust settings: ΔPinsp 20, Rate 12, TI 1.0 PEEP/CPAP 5, Flow trigger 3.0 l/min, Oxygen 21%. Prior to confirming, locate more tab for additional settings and set P-ramp to 25ms. Confirm settings and mode change.
- Start ventilation by touching “Start Ventilation” or pushing the on/off soft key

Alarms, Controls, Modes

- Using the touch screen or push and turn knob, locate and access the “Alarms” tab in the bottom right portion of the screen. Adjust alarms as needed. Close window by touching the alarms tab again or by hitting the “X” within the alarms window.
- Locate the “Controls” tab above the alarms tab and touch to access controls for your current mode. enter ΔPinsp 15, Rate 15, TI 0.9, PEEP/CPAP 8, Flow trigger 5.0 l/min, Oxygen 21%. Close window by touching the Controls tab again or by hitting the “X” within the Controls window.
- Select mode (APVcmv or (S)cmv+) from the ventilation by touching “Modes” on the top right or by touching the current mode in the top left. Adjust settings: VT 400, Rate 12, TI 1.0 PEEP/CPAP 5, Flow trigger 5.0 l/min, Oxygen 21%.
- Adjust alarms as needed
- Review Modes available including volume targeted modes

Power Supply

- In the lower right corner, identify the battery and AC icons and describe what each indicates (unplug vent to observe icon change)

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Bottom left corner of screen working from left to right

Monitoring Tab

- Review monitored values within the Monitoring tab.
- Review values listed on page 1,2, and 3
- Review values in CO2 tab is available

Tools Tab

- Verify that HPO (high pressure oxygen mode) is selected
- “Set Oxygen alarm limits manually” check box should be unchecked unless using LPO (low pressure oxygen) mode

Events Tab

- Review alarms, ventilator settings changes, and events along with the associated date and time.

System Tab

- Review “Info” tab: Battery current charge %, O2 consumption in LPM (after 2min of ventilation), and ventilator installed options.
- Review “Tests & calib” tab: Verify date and time of last Leak Test, Flow Sensor, and O2 sensor calibration.
- Complete O2 sensor calibration if needed without placing ventilator in stand-by
- Review “Sensors” tab: Activate or Deactivate O2 sensor as needed. Activate CO2 sensor is equipped
- Review “Settings” tab: Adjust alarm loudness in the “Loudness” window, screen brightness in the “Day & Night” window, and date and time in the “Date & Time” window.

CO2 Monitoring (if equipped)

- Plug in CO2 cable and place CO2 adapter into cable connection
- Select “System” Tab > Select “Sensors” Tab > Select check box next to CO2 sensor
- Select “Test & calib” tab and select “CO2 sensor” to perform calibration. Follow on screen directions to complete correctly. CO2 sensor should be removed from vent circuit when calibrating.

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Graphics

Pressure Waveform (Upper Graphic)

- Tap pressure waveform to adjust time scale
- Blue line is pressure limit (always 10cmh2o below high pressure alarm)
- Red line represents high pressure alarm
- Snowflake button in upper right corner allows for waveform freezing

Flow Waveform (Middle Graphic)

- Tap flow waveform to adjust time scaler as needed
- Tap flow waveform to access other available waveforms for continuous monitoring.

Volume Waveform (Lower Graphic)

- Tap lower graphic to open available graphics options

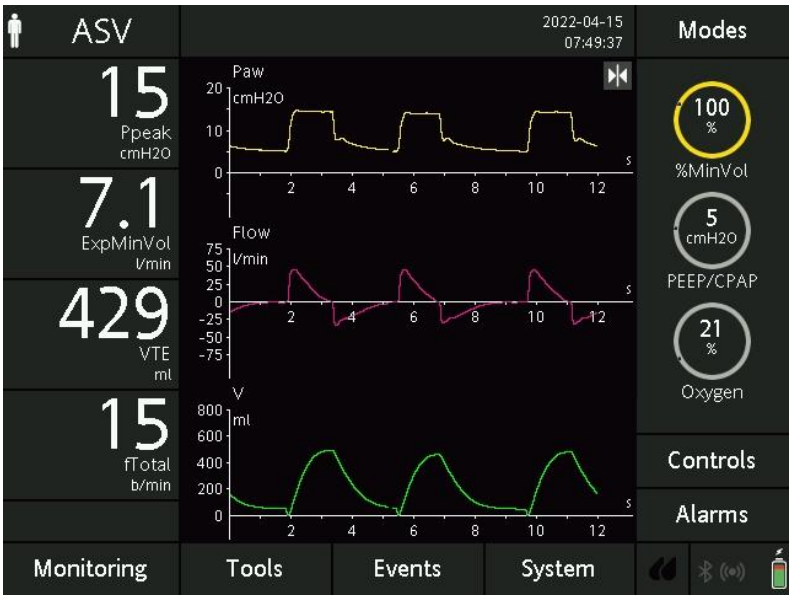
Select “Trends” tab > select “1h” > select which monitored values you want to trend in the “drop down menu” > select “confirm

Trending (if equipped)

- Tap lower graphic to open available graphics options
- Select “Trends” tab > select “1h” > select which monitored values you want to trend in the “drop down menu” > select “confirm”

Loops (if equipped)

- Tap lower graphic to open available graphics options
- Select “Loops” tab and select loop of your choice
- Record a loop by tapping the loop record button located at the top right corner of the loop graphic. Tap again to remove recorded loop



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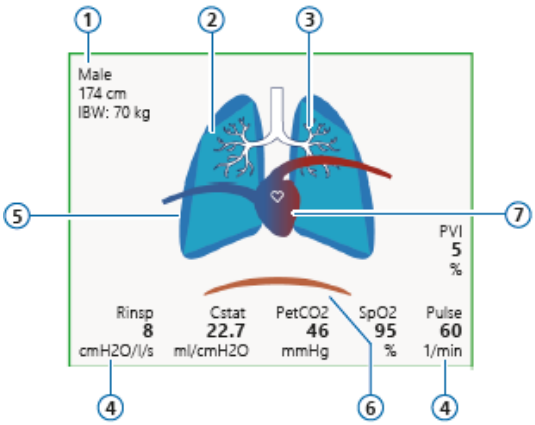
Dynamic Lung

- Tap lower graphic to open available graphics options
- Select “Graphics” tab > select “Dynamic Lung” tab



1 Sex, height, IBW
2 Real-time representation of lung compliance
3 Real-time representation of airway resistance
4 Parameter values
5 Real-time representation of breaths and tidal volume
6 Patient trigger (diaphragm)
7 Heart and pulse display*

Visualizes in real-time:

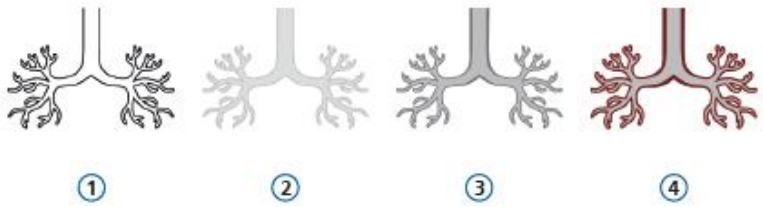
- Tidal volume
- Lung compliance
- Resistance
- Patient triggering

The lungs expand and contract in synchrony with patient breaths.

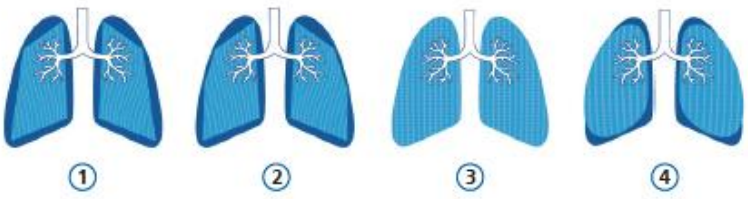
When all values are within the specified ranges, the panel is framed in green.

* When SpO2 is activated and the sensor is connected.

*pt height/IBW should be entered even if not using ASV as Dynamic Lung looks up normal values based on IBW.



1 Resistance information is unavailable
2 Normal resistance
3 Moderate resistance
4 High resistance



1 Very low compliance
2 Low compliance
3 Normal compliance
4 High compliance

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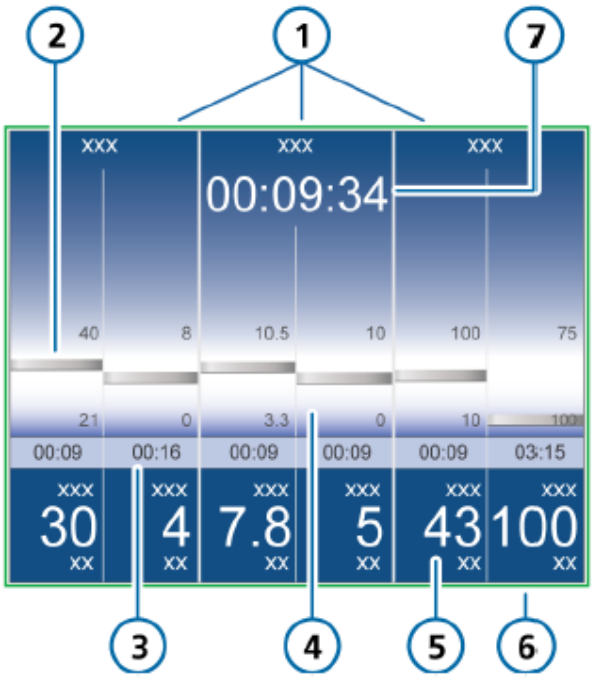
Vent Status

- Tap lower graphic to open available graphics options
- Select “Graphics” tab > select “Vent Status” tab

Vent Status Components:

Vent Status gives visual representation of six parameters related to the patient and ventilatory support grouped into:

- Oxygenation (FIO2/PEEP)
- CO2 elimination (Ventilation- VE/Pinsp)
- Patient Activity (RSB or P0.1/ %Spont rate)
- Green ‘Timer’ window
    - Individual timers for each status bar



1 Group title

2 Monitored value, graphic (floater)

3 Elapsed time value has been in weaning zone

4 Weaning zone with user-config-urable limits

5 Monitored value, numeric

6 Green outline indicating all values are in the weaning zone

7 Elapsed time all values have been in weaning zone

POLICY: Heat and Moisture Exchange (HME)

PURPOSE:

1. Humidification of inspired air plays an essential role when the upper airway is bypassed by a tracheostomy. Without adequate humidification, impairment of mucociliary clearance due to thickened secretions may occur. Other problems include destruction of airway epithelium and atelectasis.

2. Heat and Moisture Exchangers (HME) and Hygroscopic Condenser Humidifiers (HCH) have been tested and used extensively to reclaim heat and water from the patient/resident's own expired air as opposed to obtaining them from external sources.

3. HMEs and HCHs differ in that HCHs use hygroscopic salt to chemically improve the heat and moisture exchange. In addition, most HMEs and HCHs act as efficient bacterial and viral filters.

POLICY:

HME/HCH may be used in place of standard mechanical ventilator humidifiers for short term (i.e. < 24 hours) mechanical ventilation in acute care cases. For chronic ventilator patients/residents, HMEs and HCHs are used for transportation and a backup humidifier.

PROCEDURE:

1. Make sure the standard ventilator humidifier has been bypassed.
2. Place HME or HCH between the ventilator wye adapter and the 15mm connector of the artificial airway, paying particular attention to the direction of flow indicator arrow. It should be pointed towards the patient/resident.
3. Routinely inspect and replace the HME/HCH, as necessary, if secretions accumulate in the housing.
4. If clear water has built up inside the housing, it may be disconnected and drained without replacement.

WARNING/PRECAUTIONS:

Prolonged use of HME/HCHs may lead to under hydration and impaction of mucous secretions, which could lead to one of the following:

1. Hypoventilation and or alveolar gap trapping due to mucous plugging of airways.
2. Increased resistive work of breathing due to:
    a. Mucous plugging of airways.
    b. The HME/HCH itself.
3. HME/HCEs are hydrophobic and will not allow water or secretions to pass in either direction.
4. The HME/HCH must be removed during nebulization of drugs.
5. HME/HCHs are a single patient/resident use/non-sterilization product.
6. Do not use on a spontaneously breathing patient/resident who may present with difficulty during weaning due to low spontaneous tidal volume or excessive PCO2.

7. Some devices have internal volumes as high as 90cc's. Caution should be used on patients having body weights of less than 50 lbs. (23kg) or a tidal volume of less than 150 cc. The HME/HCH must be individually sized for each patient/resident according to their VT, age and weight.
8. Neonatal/Infant HMEs are available for smaller patients/residents.
9. Compensation for lost volume due to dead space may be necessary in some patients/residents.
10. HME/HCH are not recommended for patients/residents who produce large amounts of secretions. Patients/residents who have thick or bloody secretions should be excluded from using them.
11. Do not use HME/HCH on patients/residents with a core temperature less than 32 OC, an expired VT less than 75% of inspired V, or a minute volume greater than 10 liters/minute.

POLICY: Flow Nasal Therapy with Vapotherm Precision Flow

PURPOSE

The respiratory care practitioner will utilize the protocol to deliver High Flow Therapy to patients/residents requiring High Flow Therapy Oxygen support via the Vapotherm *Precision Flow.*

- To provide guidelines for identifying patients/residents to who High Flow Therapy Oxygen therapy may be an indicated therapy.
- To provide guidelines for identifying the contraindications and patient/resident toleration of High Flow Therapy Oxygen therapy via the Vapotherm *Precision Flow.*

PRINCIPLE OF OPERATION

- The Vapotherm *Precision Flow* warms and humidifies high flows of medical gas for delivery to patients/residents.
- Warming and humidification occur in the Vapor exchange cartridge where air and water are separated by a membrane permeable to water vapor but not liquid.
- The warmed humidified gas flow reaches the patient/resident via the delivery tubing. This tubing insures the temperature is maintained and decreases condensation.
- The gas supply from the Vapotherm *Precision Flow* to the patient/resident should be supplied at 1-8 l pm flow when used in the pediatrics and a 5-20 l pm flow for the teens thru adult population.
- A built-in oxygen blender will be used to adjust the delivered Fio2 to all patients/residents as indicated.

POLICY / PROCEDURE & SPECIAL CONSIDERATIONS

Indications for High Flow Therapy Oxygen Therapy

- Presence of conditions requiring high oxygen flow and concentrations
- Acute respiratory failure
- Asthma Exacerbation

If there is any discrepancy noted between the on-line version and the printed version of this policy/procedure, the on-line version is the true and accurate version.

- Infant respiratory distress
- Hypoxia
- Apnea of pre-maturity
- Pneumonia

Contraindications for High Flow Therapy

- Patient/resident with Apnea.

- Patient/resident unable to maintain oxygenation and / or ventilation while on Vapotherm *Precision Flow*.
- Patients/residents unable to tolerate High Flow Therapy.

Adverse reactions may include, but are not limited to:

- Increased work of breathing
- Unable to maintain oxygenation and / or ventilation
- Apnea

If any adverse reaction(s) are observed the RCP will:

- Notify the Physician / Nurse Practitioner
- Suggest alternate therapy
- Institute alternate therapy
- Observe patient/resident condition and toleration of alternate therapy and adjust to meet patient/resident's condition.

SET UP AND INITIATION OF THERAPY

- Assure that the *Precision Flow* –Disposable Water Path (DWP) has the correct Vapor transfer cartridge (VTC) in place (with caps removed) and the patient/resident delivery tubing is connected to the DWP. The VTC has no top or bottom. It cannot be installed upside down.
- Place the DWP into the Vapotherm by sliding the blue top cover forward and sliding the DWP into the unit while holding the DWP handle until it is securely seated.
- Attach the desired size interface (cannula and trach collar) to the distal end of the Delivery tubing.
- After hanging a sterile water bag (1000ml for Infants / 2000ml for Adults) use an alcohol prep to wipe the clamped spike before placing the spike into the sterile water bag.
- The water supply line should remain clamped until ready to fill unit.
- Plug in power cord and attach the high pressure gas lines to Air and Oxygen outlets. Unclamp the water spike and allow 200ml of water to flow into the delivery tubing before powering the Vapotherm on.
- Press the RUN / Standby button to enter the Run mode. The Amber light above Run / Standby will now show Green. This indicates the unit is operational. This will start the Vapotherm pumps and gas flow will begin.
- The unit is ready for normal operation.
- Set desired Temperature/ Flow/ Oxygen percentage by pressing the control knob until the desired display flashes. Rotate the control knob until the desired setting is displayed in the window. Press the control knob to move to the next parameter. When parameter is flashing rotate the control knob until the desired setting is in the display window. The setting will be locked in if you press the control knob to move to the next parameter. It will also be locked in if you do not touch a control for 10 seconds.

- When the unit has reached the desired Oxygen level and Temperature you can apply the cannula to the patient/resident.
- Patients/residents in Isolettes should have Vapotherm temp set the same as the Isolette temp (Not the patient/resident temp) to avoid "Rainout".
- During normal use the Display Screen will go blank. This is an energy saving feature. The unit is in Run Mode as long as the light above Run / Standby is green. The Display will return after any control is pressed.
- Fit cannula or trach collar to patient/resident.

Adjust flow and FiO2 to ordered levels

< 6 months	1 - 8 LPM
6 months- 2 years	8 - 10 LPM
2 years - 6 years	10 - 15 LPM
6 years – 10 years	12 - 20 LPM
10 years – 15 years	15 - 25 LPM
15 years – 18 years	20 - 30 LPM
> 18 years	20 – 40 LPM

Follow in Physician / NP order when adjusting /weaning the patient/resident. Inform Physician / NP if patient/resident does not tolerate Vapotherm and suggest alternative modes of therapy.

Documentation

Rounds will be documented in the patient/resident EMR record per department policy of Q6 hours.
The Oxygen concentration, Temperature and Liter flow of delivery gas will be included in Vapotherm Therapy documentation.
Changes in the Oxygen concentration, and or Liter Flow of delivery gas will be documented on the patient/resident's EMR record at the time the change was made.

TROUBLE SHOOTING ALARMS AND INDICATORS

Below is a list of Vapotherm Alarms with possible causes and solutions, as well as the location of the Alarms on the Vapotherm Display.

Blocked Tube- This indicates the cannula or delivery tube may be kinked, or that the cannula attached is incorrect for the set gas flowrate.
Solution - resolve blockage or change to a larger cannula.

Location- Below "Flowrate" setting on the left of the display screen.

General Fault (flashing and O2 display shows - -) -This indicates a depleted or defective Oxygen cell.
Solution- Replace the Oxygen cell.
Location - Below the Blocked Tube indicator on the bottom left of the display screen.

General Fault (flashing) - This indicates a malfunction of the internal senor or control unit.
Solution - Remove from service and replace with a functional unit.
Location - Below the Blocked Tube indicator on the bottom left of the display screen.

Water out (flashing)- This indicates the system has no water. This may be the result of a blocked water supply tube or an empty water bag. The flow will continue but the system will not heat.
Solution- Resolve the blockage or replace the water bag.
Location - Beside the Set Temp indicator on the bottom left of the display screen.

DWP Fault (flashing) - This indicates that the Disposable Water Path is faulty, not seated well or not installed. The unit will not deliver flow or heat to the patient delivery system.
Solution- Check for proper installation of the DWP. If present and correctly installed remove and replace the DWP with a new set up.
Location- The upper right of the display beside the Oxygen control setting.

Cartridge type- If an infant VTC is in place a Red "Lo" symbol is displayed a Lo flow VTC is installed and functional. If an Adult VTC is in place a Green "Hi" symbol is displayed a Hi flow VTC is installed and functional.
Location- The lower right of the display screen beside the set Temp.

Cartridge Fault- The cartridge or DWP is either not installed or faulty. System will not run.
Solution- Remove patient/resident and provide an alternate Oxygen delivery method and replace or install a replacement DWP and or VTC.

Gas Supply Fault flashing- The Gas supply pressure is either low or exhausted.
Solution- Remove the patient/resident and provide an alternate Oxygen delivery method. Evaluate the gas delivery system and replace the Vapotherm unit if necessary. *Location*- Lower right of display screen beside the Set Temp.

MAINTENANCE: The following are items that shall be checked Q6h as per the High Flow Therapy flowsheet and documented in the EMR.

1. Check the position of the mask or prongs in the nares for breakdown.
2. Check the breathing circuit for any condensation and drain as needed.
3. Verify twice per shift and monitor Oxygen concentrations.
4. Suction nares as necessary.
5. Note heartrate and SaO2 via pulse oximeter.
6. Change circuit and mask/prongs Q30 days and PRN.

CONTRAINDICATIONS:

1. Frequent apnea with a duration of 20 seconds or greater.
2. Bradycardia or severe cyanosis.
3. Clinical evidence of fatigue.
4. SaO2 of 60% or less with FIO2 of 100%.
5. O2 saturation of 85% or less with and FIO2 of 100%.
6. Severe labored breathing.

SETUP AND MONITORING: The Respiratory Care Department shall be responsible for the set up, monitoring and troubleshooting of all equipment.

DISCONTINUATION OF High Flow Therapy: High Flow Therapy should be discontinued when:

1. Clinical improvement is noted, such as respiratory rate returning to patient/resident's normal rate. Cessation of mild retractions or labored breathing.
2. Improvement in SpO2 with a lowering of FiO2.
3. High Flow Therapy Weaning Algorithm may be used to wean patients/residents.

REFERENCES:

Precision Flow – Operator Instruction Manual (2-27-2009)
3001002 Rev G

POLICY: High Flow with AIRVO2

POLICY:

AIRVO™ 2 High Flow Heated System is for the treatment of spontaneously breathing patient/ resident who would benefit from receiving high flow warmed and humidified respiratory gases.

DEFINITION:

The AIRVO™ 2 is a humidifier with integrated flow generator that delivers high flow warmed and humidified respiratory gases to spontaneously breathing patients/residents through a variety of patient/resident interfaces (Nasal Cannula, Tracheostomy Interface, and Mask Interface Adapter).

INSTRUCTIONS:

Ensure the AIRVO™ 2 device is clean between each new patient/resident use. All circuit components are disposable and should be discarded in the patient/resident room when the device is discontinued. Device is disinfected with sanitary wipes available in Respiratory Therapist (RT) soiled utility room. Move device to clean utility room. Wrap the AIRVO™ 2 in a clean storage cover. Fill in the details on the identification label on storage cover. Store in dry area until next use. Refer to Cleaning Process and Storage.

1. Assembles equipment:

    a. Single Patient/Resident Use Prepackaged Tube and chamber kit.

    b. Oxygen tubing adapter (for connecting oxygen tubing to the high or low flow oxygen meter that is mounted on the AIRVO™ 2 pole.**)**

    c. Patient/resident interface (Nasal Cannula, Tracheostomy Interface, and Mask Interface Adapter).

2. Connects the oxygen tubing to the high or low flow oxygen meter to the inlet entrainment port on the device.

If there is any discrepancy noted between the on-line version and the printed version of this policy/procedure, the on-line version is the true and accurate version.

3. Attaches breathing heated circuit to the outlet of the water chamber.

4. Turn on the unit to check the disinfection status.

    a. AIRVO™ 2 is safe for use on a **NEW PATIENT/RESIDENT** when the traffic light is Green.

b. If the traffic light is Orange then AIRVO™ 2 has not been cleaned and disinfected since last use. This AIRVO™ 2 is **NOT** safe for use on a **NEW PATIENT/RESIDENT.**

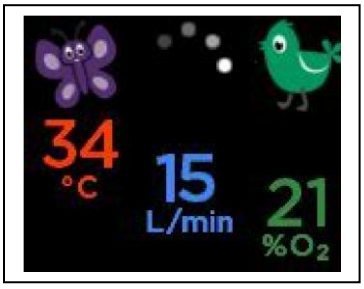
5. Starts the AIRVO™ 2 with settings ordered by MD/NP.

    a. AIRVO™ 2 is available to use in two Modes: Junior and AIRVO™ 2.

    b. Junior Mode only to use with Junior Nasal Prongs and Junior Circuit.

    c. Press and hold Mode for 5 sec, the display will switch to a Junior Mode.

Settings in Junior Mode:



1. Flow: 2-25lpm
2. Temperature: 34ºC (93º F)
3. FiO2: 21-100 (oxygen is bleed in via the Flowmeter)

Settings in AIRVO™ 2 Mode: 1.

Flow: 10-60 lpm

2.Temperature:

a. 37ºC (98.6ºF)

b. 34ºC (93ºF) if the compliance at 37oC is a problem

c. 31ºC (88ºC) for the face masks only

3.FiO2: 21-100 (oxygen is bleed in via the Flowmeter from the wall O2 **To Adjust the Flow and Temperature:**

Settings:

1. Press the Mode button to view target settings.

2. Hold the Up and Down buttons for 3 seconds to “unlock” the setting.
3. The lock will disappear and will be replaced by an arrow showing the minimum and maximum accessible settings. Press the Up and Down buttons to choose the new setting.
4. When you have finished, press the Mode button to 'lock' the setting again.

CLEANING PROCESS:

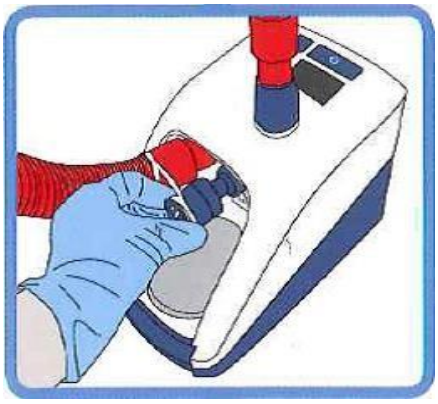
The AIRVO™ 2 device requires cleaning and disinfection between patients/residents and as needed (PRN).

1. Switches off the unit and unplugs from the power source.

2. Removes the heated breathing tube and discards all the disposable component of the circuit. (i.e. tubing, resident interface, water auto-fill camber, and water bag)

3. Using a sponge stick or detergent wipe, thoroughly clean the outlet elbow (right chamber port) of the machine from both ends, ensuring removal of any bio burden. Repeat as necessary using a clean stick/wipe. Dispose after use.

4. Wipe the exterior of the device, water bag pole, stand handle, etc.
5. Inspects setup for any cracks or interruptions in the integrity of setup.
6. Allow to air dry a few minutes.
7. Connect the AIRVO™ 2 to a power supply and start the High-level disinfection process using the red disinfection hose.
8. Connect the device to power, press and hold the disinfection button for 3 seconds to start the cleaning cycle.



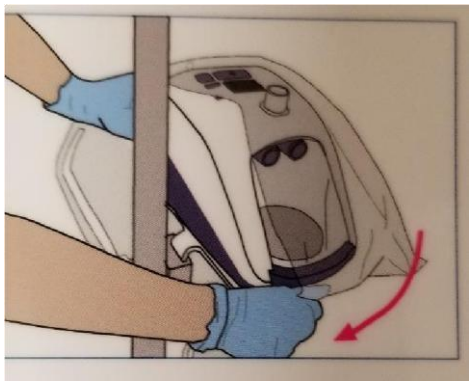
9. A calibration check runs for approximately 2 minutes before the disinfection cycle begins and runs for 55 minutes. A backwards countdown from 55 minutes is displayed during the cycle.

10. The cycle is not complete until a ZERO is displayed in the countdown. Anything else appearing in the LCD display requires the cycle to be restarted. A number will also be displayed to indicate the number of times a cleaning cycle has been run on the device.

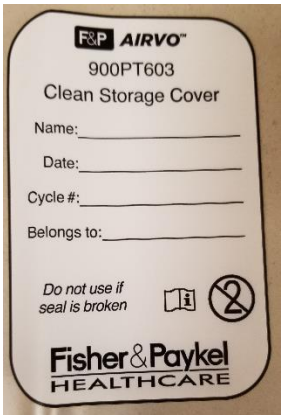
11. Ensure the cycle is complete before disconnecting.

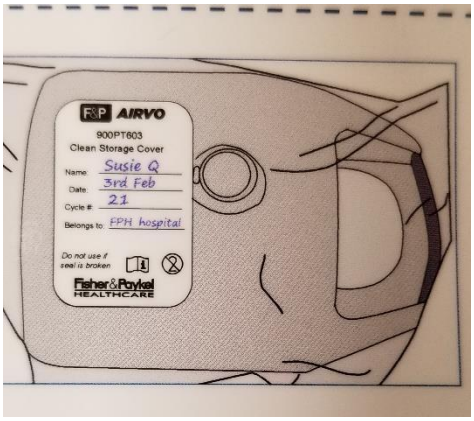
STORAGE:

1. After disinfection cycle in completed, wrap the AIRVO™ 2 in a clean storage cover.



2. Fill in the details on the identification label.





3. Store in dry area until next use.

REFERENCES:

Fisher & Paykel Healthcare AIRVO™ 2 User Manual

Fisher & Paykel Healthcare AIRVO™ 2 Disinfection Kit Manual

Mechanical Insufflation-Exsufflation Device POLICY

PURPOSE AND GENERAL DESCRIPTION:

A mechanical insufflation-exsufflation device helps a patient/resident clear retained bronchopulmonary secretions. It works by delivering a positive expiratory pressure breath of 15 to 40 cm H2O over 0.5 to 2 seconds and then reversing rapidly to a negative expiratory pressure breath of –15 to –40 cm H2O. This rapid pressure shift delivered through a face mask, mouthpiece, or tracheostomy or endotracheal tube produces a high expiratory flow rate from the patient's/resident's lungs, which simulates a cough. Each cough cycle delivered by the device consists of an inhalation phase, an exhalation phase, and may consist of a pause time, after which inhalation begins again.

POLICY:

The "Cough Assist Machine" may only be used as per a Physician/Nurse Practitioner's (NP) order. The frequency (BID, QID or PRN) and use of the machine are included in the orders. The pressures, number of cycles, and frequency and amplitude of oscillation to mobilize the secretions will be set by the Respiratory Therapist (RT). Comply with the procedures detailed in this policy. Steps for Cough Assist with or without Oscillation can be found in Procedures. All Therapies need to end on Inspiratory breath

INDICATIONS/WARNINGS:

1. The use of a cough assist device may be useful for patients/residents using non-invasive ventilation devices. For these patients/residents, the machine is applied via a face mask. Patients/Residents who have a tracheostomy are connected with a 15mm adapter and an AirLife Omni-Flex Patient Connector - Pediatric 15mm O.D. x 15mm I.D.

2. Patients/Residents who are awake, alert and orientated with an ineffective cough due to poliomyelitis, muscular dystrophy, myasthenia gravis or other neurologic disorders, should do well with the cough machine.

3. Patients/Residents who have bulbous emphysema and other obstructive diseases may be contraindicated for this therapy due to the risk of pneumothorax.

CONTRAINDICATION:

1. Pneumothorax

2. Pulmonary hemorrhaging
3. New or Recent Tracheostomy Tube placement.

TREATMENT:

Explain treatment fully to patient/resident and caregiver. Apply the mask, mouthpiece or tracheostomy adapter to the patient/resident and give the patient/resident 3-5 coughing cycles in succession. Allow the patient/resident to rest for 25-60 seconds and ask the patient/resident to cough. Clear and suction secretions as needed.

REQUIRED EQUIPMENT AND SUPPLIES:

1. Mechanical Insufflation-Exsufflation Device
2. 4-6 feet of aerosol tubing (Device may require proprietary tubing)
3. Bacteria filter (Baxter Hill-Rom Synclara requires proprietary Smart Filter)
4. 22 mm "T" adapter
5. Soft Seal "Ambu" type mask, mouthpiece or 15 mm ventilator connector with AirLife Omni-Flex Patient/Resident Connector - Pediatric 15mm O.D. x 15mm I.D.

ADMINISTRATION:

1. Set up a cough assist machine for either non-invasive or invasive application.
2. Check pressure settings and adjust as needed.
3. Apply to patient/resident for a 3-5 cough cycle.

UNDESIRABLE SIDE EFFECTS:

1. Sudden Chest Pain
2. Dizziness
3. Nausea
4. Bleeding
5. "Lightheaded" feeling
6. Pneumothorax

If an adverse response is noted, discontinued therapy and monitor the patient/resident until stable. All adverse events contact the physician immediately and document event in EMR.

CLEANING AND MAINTENANCE:

Each patient/resident will be issued cough assist tubing that will be kept in a labelled bag and left at the bedside. This circuit will discard after 30 days or when soiled.

PROCEDURES:

1) The Respironics Cough Assist Machine (T-70) with Oscillation
2) Abm BiWaze Cough System with Oscillation
3) Baxter Hill-Rom Synclara Cough System with Flutter

PROCEDURE 1: The Respironics Cough Assist Machine (T-70) with Oscillation

Set up cough assist machine for either non-invasive (Mask/Mouthpiece) or invasive (Tracheostomy tube) application.

Follow steps below for Cough Assist WITH Oscillation
All Therapies need to end on Inspiratory breath

Mode	Advanced Auto Mode
Preset	1
Cough-Trak	OFF – If Pt/Resident is on a Ventilator • On – If Pt/Resident is NOT on Ventilator
Pre-Therapy Breaths	OFF
Number of Coughs 1 to 15	Start with 5
Inhale Pressure 0 to 70 cmH_2O in increments of 1 cmH_2O	a. Infant range -/+15 to -/+25 b. Pediatric range -/+25 to -/+35 c. Adolescent range -/+35 to -/+45 d. Adult pressure -/+ 45 or greater
Inhale Flow Low/Medium/High	Start with Medium.
Inhale Time 0 to 5 sec. in increments of 0.1 sec	a. Infant 0.5 sec b. Pediatric 1. sec c. Adolescent/Adult 2. sec

Exhale Pressure 0 to -70 cmH_2O in increments of 1 cmH_2O	d. Infant range -/+15 to -/+25 e. Pediatric range -/+25 to -/+35 f. Adolescent range -/+35 to -/+45 g. Adult pressure -/+ 45 or greater
Exhale Time	a. Infant 1 sec b. Pediatric 1.5 Sec
0 to 5 sec. in increments of 0.1 sec	c. Adolescent/Adult 2. sec
Pause Time	Zero (0) pause time
Oscillation	Both
Frequency 1 to 20 Hz in increments of 1 Hz. Only available if Oscillation is activated	Start with 10 Hz
Amplitude 1 to 10 cmH_2O in increments of 1 cmH_2O. Only available if Oscillation is activated	Start with 5 cmH2O
Number of Cycles 5 to 10 breaths per cycle	3 to 5 Cycles (Unless specified by Physician)
Post-Therapy Breath	ON

- Cough-Trak - On if Pt/Resident can initiate an inspiration.

Follow steps below for Cough Assist <u>WITHOUT</u> Oscillation

<u>All Therapies need to end on Inspiratory breath</u>

Mode	Advanced Auto Mode
Preset	1
Cough-Trak	OFF – If Pt/Resident is on a Ventilator • On – If Pt/Resident is NOT on Ventilator
Pre-Therapy Breaths	OFF
Number of Coughs 1 to 15	Start with 5
Inhale Pressure 0 to 70 cmH_2O in increments of 1 cmH_2O	e. Infant range -/+15 to -/+25 f. Pediatric range -/+25 to -/+35 g. Adolescent range -/+35 to -/+45 h. Adult pressure -/+ 45 or greater
Inhale Flow Low/Medium/High	Start with Medium.
Inhale Time 0 to 5 sec. in increments of 0.1 sec	h. Infant 0.5 sec i. Pediatric 1. sec j. Adolescent/Adult 2. sec
Exhale Pressure 0 to -70 cmH_2O in increments of 1 cmH_2O	k. Infant range -/+15 to -/+25 l. Pediatric range -/+25 to -/+35 m. Adolescent range -/+35 to -/+45 n. Adult pressure -/+ 45 or greater
Exhale Time 0 to 5 sec. in increments of 0.1 sec	a. Infant 1 sec b. Pediatric 1.5 Sec c. Adolescent/Adult 2. sec
Pause Time	2 sec.
Oscillation	OFF
Number of Cycles 5 to 10 breaths per cycle	3 to 5 Cycles (Unless specified by Physician)
Post-Therapy Breath	ON

• Cough-Trak - On if Pt/Resident can initiate an inspiration.

PROCEDURE 2: abm BiWaze Cough System

Set up cough assist machine for either non-invasive (Mask/Mouthpiece) or invasive (Tracheostomy tube) application.

Follow steps below for Cough Assist <u>WITH</u> Oscillation

Mode	Auto
Inhale Pressure 0 to 15 cmH_2O in increments of 1 cmH_2O	Start with 5 cmH2O
Pause Time 0-5 sec.	Zero (0) pause time
Inhale Pressure 0 to 70 cmH_2O in increments of 1 cmH_2O	Infant range -/+15 to -/+25 Pediatric range -/+25 to -/+35 Adolescent range -/+35 to -/+45 Adult pressure -/+ 45 or greater
Inhale Time 0 to 5 sec. in increments of 0.1 sec	Infant 0.5 sec Pediatric 1. sec Adolescent/Adult 2. Sec
Exhale Pressure 0 to -70 cmH_2O in increments of 1 c mH_2O	Infant range -/+15 to -/+25 Pediatric range -/+25 to -/+35 Adolescent range -/+35 to -/+45 Adult pressure -/+ 45 or greater
Exhale Time 0 to 5 sec. in increments of 0.1 sec	Infant 1 sec Pediatric 1.5 Sec Adolescent/Adult 2. Sec
Cycles (Breaths)	10 to 20 Breaths (Unless specified by Physician)
Setting for Oscillation hit the setting menu ⚙ Bottom left-hand corner	
Oscillation	Both Inhalation/Exhalation
Frequency 1 to 20 Hz in increments of 1 Hz. Only available if Oscillation is activated	Start with 10 Hz

Amplitude 1 to 10 cmH_2O in increments of 1 cmH_2O. Only available if Oscillation is activated	Start with 5 cmH2O
Inhale Flow Low/Medium/High	Start with Medium.
Inspiration Trigger On/Off	Leave off
Inspiration Trigger Sen. 1 – 10 cmH2O	Start with 2

Follow steps below for Cough Assist <u>WITHOUT</u> Oscillation

<u>All Therapies need to end on Inspiratory breath</u>

Mode	Auto
Inhale Pressure 0 to 15 cmH_2O in increments of 1 cmH_2O	Start with 5 cmH2O
Pause Time 0-5 sec.	Zero (0) pause time
Inhale Pressure 0 to 70 cmH_2O in increments of 1 cmH_2O	Infant range -/+15 to -/+25 Pediatric range -/+25 to -/+35 Adolescent range -/+35 to -/+45 Adult pressure -/+ 45 or greater
Inhale Time 0 to 5 sec. in increments of 0.1 sec	Infant 0.5 sec Pediatric 1. sec Adolescent/Adult 2. Sec
Exhale Pressure 0 to -70 cmH_2O in increments of 1 c mH_2O	Infant range -/+15 to -/+25 Pediatric range -/+25 to -/+35 Adolescent range -/+35 to -/+45 Adult pressure -/+ 45 or greater

Exhale Time 0 to 5 sec. in increments of 0.1 sec	Infant 1 sec Pediatric 1.5 Sec Adolescent/Adult 2. Sec
Cycles (Breaths)	10 to 20 Breaths (Unless specified by Physician)

PROCEDURE 3: Baxter Hill-Rom Synclara Cough System

Follow steps below for Cough Assist <u>WITH</u> Flutter
<u>All Therapies need to end on Inspiratory breath</u>

Mode	Automatic
Number of Cycles 1 to 20	Start with 12
Inhale Pressure 10 to 45 cmH_2O increments of 1 cmH_2O	Infant range -/+15 to -/+25 Pediatric range -/+25 to -/+35 Adolescent range -/+35 to -/+45 Adult pressure -/+ 45 or greater
Inhale Flow Low/Medium/High	Start with Medium
Inhale Time 0 to 5 sec. increments of 0.1 sec	Infant 0.5 sec Pediatric 1. sec Adolescent/Adult 2. sec
Exhale Pressure -10 to -70 cmH_2O increments of 1 cmH_2O	Infant range -/+15 to -/+25 Pediatric range -/+25 to -/+35 Adolescent range -/+35 to -/+45 Adult pressure -/+ 45 or greater
Exhale Time 0 to 5 sec. in increments of 0.1 sec	Infant 1 sec Pediatric 1.5 Sec Adolescent/Adult 2. sec
Pause Time	Two (2) sec pause time

Flutter	Both
Frequency 1 to 20 Hz in increments of 1 Hz. Only available if Oscillation is activated	Start with 10 Hz
Amplitude 1 to 10 cmH_2O increments of 1 cmH_2O. Only available if Flutter is activated	Start with 5 cmH2O
Post-Therapy Breath	ON

Follow steps below for Cough Assist <u>WITHOUT</u> Flutter

<u>All Therapies need to end on Inspiratory breath</u>

Mode	Automatic
Mode	Start with 12
Number of Cycles 1 to 20	Infant range -/+15 to -/+25 Pediatric range -/+25 to -/+35 Adolescent range -/+35 to -/+45 Adult pressure -/+ 45 or greater
Inhale Pressure 10 to 45 cmH_2O increments of 1 cmH_2O	Start with Medium
Inhale Flow Low/Medium/High	Infant 0.5 sec Pediatric 1. sec Adolescent/Adult 2. sec
Inhale Time 0 to 5 sec. increments of 0.1 sec	Infant range -/+15 to -/+25 Pediatric range -/+25 to -/+35 Adolescent range -/+35 to -/+45 Adult pressure -/+ 45 or greater
Exhale Pressure -10 to -70 cmH_2O increments of 1 cmH_2O	Infant 1 sec Pediatric 1.5 Sec Adolescent/Adult 2. sec
Exhale Time 0 to 5 sec. in increments of 0.1 sec	Two (2) sec pause time
Pause Time	Off

Flutter	N/A
Frequency 1 to 20 Hz in increments of 1 Hz. Only available if Oscillation is activated	N/A
Amplitude 1 to 10 cmH_2O increments of 1 cmH_2O. Only available if Flutter is activated	N/A
Post-Therapy Breath	On

POLICY: Mechanical Ventilation Circuit Changes

PURPOSE:

Our goal is to promote the safest and most efficient method of handling mechanical ventilator circuits (pediatric and neonatal), in order to safely ventilate the patient/resident and prevent transmission of infection.

BACKGROUND:

Improvements in technique and technology have spurred the CDC to conclude that ventilator circuit changes may be extended way beyond their previous recommendations at 48 hours. Reduced circuit handling has been identified as the single most important factor in lowering ventilator association nosocomial pneumonia (VAP) rates. In response, the respiratory community over the past 10 years has changed from an almost universal 48-hour practice to 30day changes, without increasing VAPs.

POLICY:

Mechanical Ventilation circuits will be changed every 30 days and PRN (i.e., damaged circuit, excess contamination and visibly soiled).
(Refer to *Respiratory Policy:* Weaning from Mechanical Ventilation)

Indications/Contraindications for a 30-day change:

1. Respiratory Therapist (RT) will inspect the circuit daily for obvious contamination/ damage.
2. Any circuit that is visibly soiled, has a foul odor or damaged will be changed immediately, regardless of the number of days in use.

Equipment/Supplies:

1. New Ventilator circuit and humidification chamber
2. Filter
3. Elbows and blue oxygen adapter
4. Sterile water for humidification
5. Bag Valve Mask (BVM)

Procedure:

1. Assemble necessary equipment at the bedside.
2. (2) RTs should perform this task whenever possible.
3. Wash hands and use universal precautions. A mask is recommended.
4. Explain procedure to patient/resident or caregiver.
5. Note all critical ventilator parameters, especially Peak Airway Pressure and Exhaled Tidal Volumes.

6. Preoxygenate patient/resident before first disconnection.
7. Bypass the humidifier using the inspiration limb of the old circuit. Do this at the beginning of inspiration.
8. Replace the humidification chamber and connect the new inspiratory limb.
9. Disconnect the remaining older circuit and connect the new one immediately. For less stable patients/residents, a second RT should be available to use the BVM on the patient/resident as the circuit is being changed.
10. Once the new circuit is in use, ventilator parameters and patient/resident assessment should be checked.
11. Remove and properly dispose of the old circuit in waste basket.
12. Ensure proper water level in humidifier.
13. Document a full ventilator check in Electronic Medical Record (EMR).
14. Document in EMR the date of respiratory circuit change, and properly label the circuit.
15. Wash hands before leaving room.

Hazards:

Monitor the patient/resident and ventilator for changes in any or all of the following:

- Reduced oxygen saturations
- Sudden increase/decrease in ventilator pressures
- Decrease/increase in tidal volume
- Decrease/increase in PEEP
- Patient/Resident Ventilator Dysynchrony

POLICY: Metered Dose Inhaler (MDI) Treatment for Non-Intubated Patients/Residents

PURPOSE:

To deliver aerosolized medication to the pulmonary system using a Metered Dose Inhaler (MDI) and the appropriate spacing device to enhance deposition.

POLICY:

The Respiratory Care Department will provide equipment, education or training for the MDI to maintain airway patency and provide clearance of retained secretions.

PHYSCIANS/NP'S ORDER:

The order must include:

1. Type of medication
2. Number of puffs to be delivered.
3. Frequency/Duration
4. Mode of administration

INDICATIONS:

1. Demonstrated reversibility of airway obstruction with bronchodilator medications secondary to bronchospasm.
2. The patient/resident is able to understand and cooperate with the correct use of a MDI.
3. Patients/residents that are currently or will be using a MDI as part of their home care regime.
4. GOALS:
    a. Improve drug efficacy
    b. Improve dosing accuracy
    c. Easier, rapid administration
    d. Reduced nosocomial risk

RELATIVE CONTRAINDICATIONS:

1. Adverse side effects of medications.
2. Patients/residents in extreme distress with increased work of breathing and inspiratory flow too low to inhale from MDI.

REQUIRED EQUIPMENT AND SUPPLIES:

1. MDI is to be kept in patient/resident's drawer in Omnicell.
2. Spacer device is to be kept at patient/resident's bedside in clean plastic bag. This will be provided by Respiratory Care.
3. Personal Protective Equipment (PPE)

PROCEDURE:

1. Check physicians/Nurse Practitioner's (NP) order in EMR.
2. Explain purpose and procedure to the patient/resident to help them understand and educate.
3. Wash hands, don gloves (PPE).
4. Shake canister before use to adequately mix the medication.
5. Connect MDI to spacer device.
6. Document a pre/post assessment on the Nebulizer Assessment Sheet in the EMR.

METHODS OF ADMINISTRATION:

1. **Via Mouthpiece:**
    a. Patient/resident should exhale slowly and place the mouthpiece of the spacer in their mouth. Close the lips tightly, then have them press the top of the canister down firmly to discharge the drug.
    b. Begin and continue to inhale slowly and deeply in order to carry the drug into the lungs.
    c. Hold in a deep breath for as long as comfortable.
    d. Exhale slowly through pursed lips to prolong drug disposition and to keep small airways open.
    e. When more than one puff is ordered, wait 1-2 minutes and then repeat. This will allow bronchodilation to occur so that the next puff can penetrate further into the lungs. The canister should be re-shaken before each puff.
2. **Via Mask:**
    a. Apply mask to patient/resident's face after shaking canister. Watch the thin membrane window on the mask collapse inward as the patient/resident breathes int. This indicates an adequate inspiratory flow.
3. **Via Trach:**
    a. Attach the MDI with spacer directly to the trach. Follow the same procedure for use as the mouthpiece. After administration, the patient may be manually ventilated with a resuscitation bag in the event the patient/resident cannot breathe deeply.

POST TREATMENT:

1. Ask patient/resident to cough to evaluate patient/resident effort and sputum production.
2. Place used spacer in clean plastic bag with patient/resident's name. Wipe as needed.
3. If via mouthpiece, have patient/resident rinse mouth to prevent candidiasis.

POLICY: Metered Dose Inhaler (MDI) Treatment via Mechanical Ventilation

PURPOSE:

To deliver aerosolized medication to the pulmonary system using a Metered Dose Inhaler (MDI) and the appropriate spacing device to enhance deposition, in a mechanical ventilation circuit.

POLICY:

The Respiratory Care Department will administer treatments and provide equipment to maintain airway patency and provide clearance of retained secretions.

PHYSCIANS/NP'S ORDER:

The order must include:

1. Type of medication
2. Number of puffs to be delivered.
3. Frequency/Duration
4. Mode of administration

INDICATIONS:

1. Demonstrated reversibility of airway obstruction with bronchodilator medications secondary to bronchospasm.
2. Asthma/Reactive Airway Disease
3. Chronic Bronchitis/Bronchiectasis
4. Severe Laryngitis/Tracheitis
5. Chemical trauma to lung or upper airway.
6. Wheezing/Bronchospasm
7. Impaired mucociliary clearance.
8. Patients/residents that are currently or will be using an MDI as part of their home care regime.

9. GOALS:
    a. Improve drug efficacy
    b. Improve dosing accuracy
    c. Easier, rapid administration
    d. Reduced nosocomial risk

RELATIVE CONTRAINDICATIONS:

1. Adverse side effects of medications.
2. Patients/residents in extreme distress with increased work of breathing and inspiratory flow too low to inhale from MDI.

REQUIRED EQUIPMENT AND SUPPLIES:

1. MDI is to be kept in patient/resident's drawer in Omnicell.
2. Spacer device is to be kept at patient/resident's bedside in clean plastic bag. This will be provided by Respiratory Care.
3. Personal Protective Equipment (PPE)

PROCEDURE:

1. Check physicians/Nurse Practitioner's (NP) order in EMR.
2. Explain the purpose and procedure to the patient/resident/caregiver.
3. Wash hands, don gloves (PPE).
4. Make sure airway is clear, suction if necessary.
5. Shake canister before use to adequately mix the medication.
6. Connect MDI canister to spacer and place on the inspiratory limb of the ventilator circuit. This should be located at the wye adapter.
7. Document a pre/post assessment on the Nebulizer Assessment Sheet in the EMR.

POST TREATMENT:

1. Ask patient/resident to cough to evaluate patient/resident effort and sputum production.
2. Place used spacer in clean plastic bag with patient/resident's name. Wipe as needed.
3. If via mouthpiece, have patient/resident rinse mouth to prevent candidiasis.

POSSIBLE ADVERSE EFFECTS:

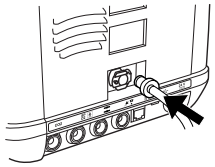
1. Bronchospasm
2. Decreased in SpO2
3. Cardiac Arrhythmia's
4. Skeletal Muscle Tremor

Usage of Oxygen (Accessory)

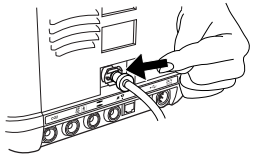
- O_2 must be turned off when the Vivo 45 LS is not in operating mode!
- It is recommended to monitor the oxygen concentrations.

1. Mount the oxygen tube to the connector.

2. Connect the oxygen tube. A click sound is heard when the tube is properly attached.

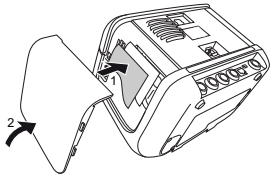


Disconnect:
1. Turn off the oxygen source.
2. Press the release button to disconnect the oxygen tube.
3. Remove the tube.



Replacement of the Patient Air Inlet Filters

The filters are located in the filter cassette.
Washable Filter (grey): Replace at least once a year, wash at least once a week.
Disposable Filter (white): Replace at least every 4th week, or more often in high pollution or pollen-rich environments.



Symbols

Symbol	Description
	Internal battery
	Click-in battery level
	Home Mode activated
	Humidifier and/or heated circuit connected
	SpO2 sensor connected
	FiO2 connected
	EtCO2 connected
	PtcCO2 connected
	Effort belt connected
	Multiple pages
>>	Multiple content available

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Vivo 45 LS

Quick Reference Guide
Doc. 007726 En M-2
2022-11-30

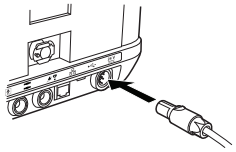
vivo by Breas From hospital to home

Quick Reference Guide

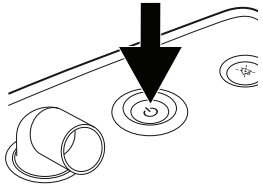
This is not a complete guide for the Vivo 45 LS. See your manual for complete instructions.

Switch On/Off

1. Plug the power supply into the Vivo.



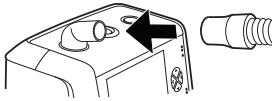
2. Press the Start/Stop button on the top panel.
   If a pre-use test is prompted, follow the instructions on the screen.



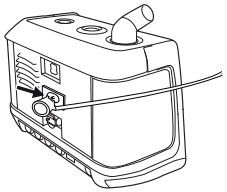
Connect the Patient Circuit

Always perform a pre-use test when the patient circuit is replaced or modified.
If the pre-use test is not prompted at start up, you can start it from the Others section.

1. Connect the patient circuit to the patient air outlet on the ventilator.



2. If having an active exhalation valve patient circuit, connect the pilot pressure tube at the back of the ventilator.

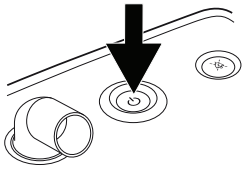


3. Connect the other end of the tube to the patient interface.

For leakage circuits, the leak should be at least 12 l/min at 4 cmH2O to prevent rebreathing of exhaled air.

Start/Stop Treatment

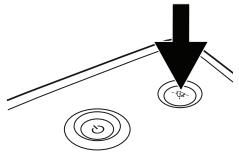
1. To start treatment and enter operating mode first press and hold the Start/Stop button on the top panel.



2. Release the Start/Stop button when the progress bar is filled.

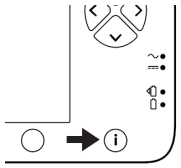
3. To stop treatment and enter standby mode first press and hold the Start/Stop button on the front panel.
4. Release the Start/Stop button when the progress bar is filled.

5. Press the Audio Pause button to stop the treatment.



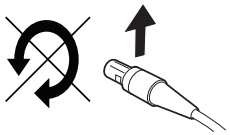
i-Button

Use the i-button to get explanations about settings and alarms.

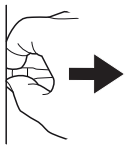


Handle the Connectors

Make sure that the marking is facing up.

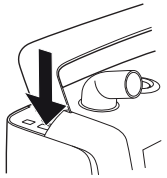


Pull the connector sleeve, not the cable itself to release the connector.

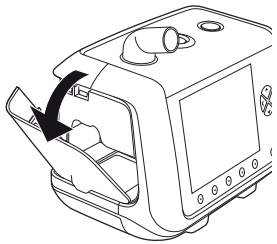


Connect the Click-in Battery (Accessory)

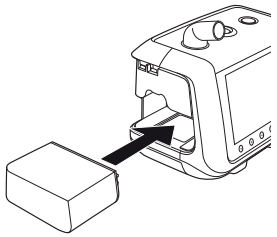
1. Release the side cover by pressing the button under the handle.



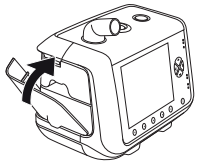
2. Open and remove the side panel.



3. Insert the click-in battery. Make sure the latch at the bottom of the click-in compartment is engaged.



4. Close the side panel. Make sure there is a clicking sound to secure the side panel.



SERVO-U

– hands-on guide

This document is intended to provide information to an international audience outside of the US.

GETINGE

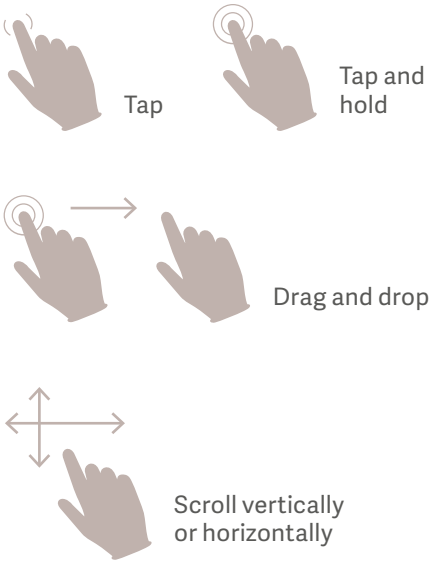
Introduction

There are different ways to navigate the user interface, adjust settings and get support.

The objective with this SERVO-U® hands-on guide is to guide you through some of the most important steps you need to familiarize yourself with when starting to use the SERVO-U ventilator. Please see the User Manual for more information.

To go through these exercises you need a SERVO-U 2.1, O_2 and air supply, patient circuit and a test lung. The exercises can be done individually or in sections. It takes approximately 30 minutes to do the entire SERVO-U hands-on guide. Knowledge Check questions with answers can be found at the end of the guide.

NOTE: Some modes are options and might not be included.



Confirm the settings by tapping Accept or the green check mark.

Exit settings without changing by tapping cancel or the red x.

Close by tapping the green x.

Setting up the SERVO-U

Follow step by step (see corresponding images and notes):

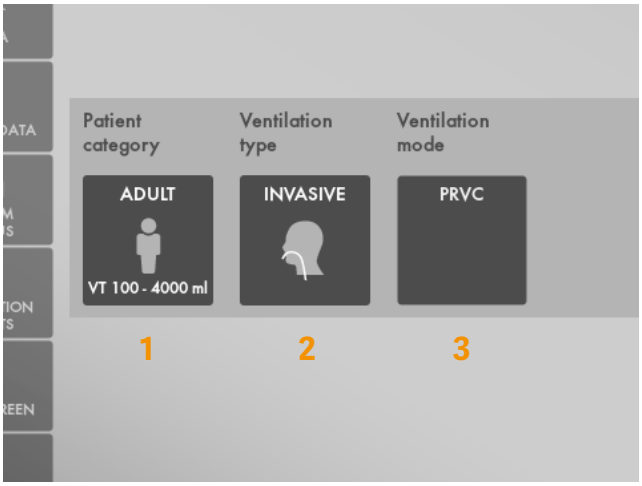
1. Plug in the power cord.
2. Open the hatch on the side and switch the ventilator to on.

   NOTE: When switching on the SERVO-U, you need to pull the ON/OFF switch downwards.
3. Connect the air and oxygen hoses.
4. Lock the wheels. It's important to lock the wheels when the ventilator is in use to avoid accidental movement of the ventilator.
5. Start the **PRE-USE CHECK**.
   (You need the test tube during the Pre-Use Check).
6. Follow the instructions on the screen.
7. Included in the Pre-Use Check is the patient circuit test. Connect the patient circuit.
8. Connect a test lung to the patient circuit.

   NOTE: Pre-Use Check includes pressure and flow transducers calibration. Each test starts automatically after the previous test is completed. The patient circuit test is included in the Pre-Use Check, but can be selected separately.
9. Choose patient category: **ADULT. (1)**
10. Choose Ventilation type: **INVASIVE. (2)**
    (You can also choose NON INVASIVE here).
11. Tap on Ventilation mode **PRVC. (3)**
    (Depending on start up the configuration a different mode can be shown here.)

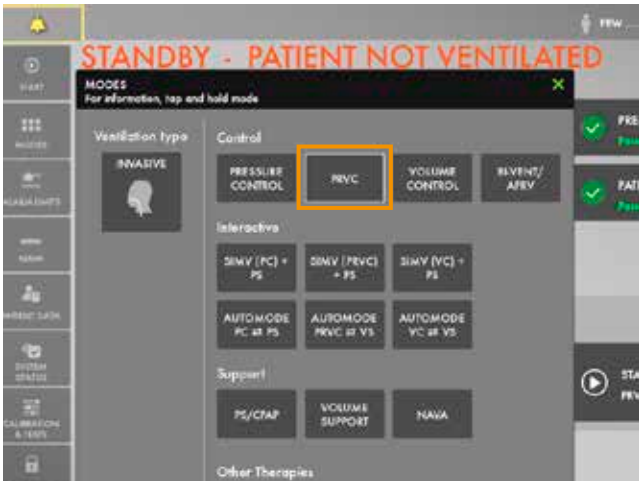
    NOTE: Some modes are options and might not be included. Information is available for each mode.
12. Then tap and hold the **PRVC** tile. **(4)**
13. Close by tapping ✕.

2



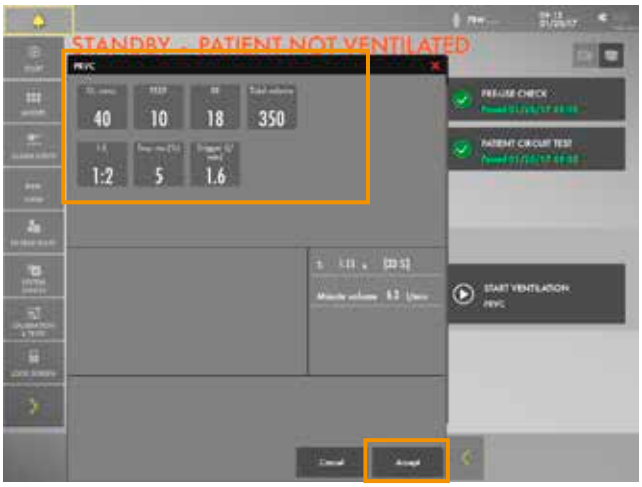
9–11

4



12

14. Select Mode by tapping **PRVC**.
15. Change the:
    - Tidal volume to 350ml
    - Respiratory rate to 18b/min
    - Peep to 10cm H_2O
16. **ACCEPT** the mode settings. **(1)**
17. Go to **ALARM LIMITS** in **QUICK MENU**. **(2)**
18. Change the alarm limits:
    - Alarm sound: 6
    - Ppeak: 30cm H_2O
    - RR (Respiration Rate): High 12b/min
    - Mve (Minute volume): Low 8.0L/min
19. **ACCEPT** the alarm settings. **(3)**
20. Tap **START VENTILATION**.



14–15

16–19

Alarms

21. The alarms are turned off for 30 seconds after starting ventilation. **(4)**

    NOTE: Alarms can be in one of three colours: red, yellow or blue, depending on priority.
22. Tap the activated alarm in message bar **(5)** and read the messages.

    NOTE: The number of alarms that are active are displayed in the status bar at. (6)
23. Tap the red tile in the numerical values **MVe** alarm. **(7)**

    NOTE: By tapping the activated alarm in the numerical values field, you gain access to the alarm setting (shortcut).

21–23

24. Go to alarm limits. Adjust the alarms so none are active.

    NOTE: The arrow indicates the current measured value. (1)

25. Activate the **AUTOSET** function by tapping. **(2)**

    NOTE: The alarm autoset function can only be used in controlled modes.

26. Tap the i placed next to Ppeak alarm setting. **(3)** You can find more information about the alarm setting there.

    NOTE: The information sign can be found in different positions on the Graphic User Interface.

27. **ACCEPT** the alarm settings.

    NOTE: When ventilating, you can see that the patient circuit test has been performed by the symbol - The symbol will not appear if a patient test has not been done. (4)

28. Decrease the PEEP to 4 cm H_2O (use the direct access keys) and increase the scale by tapping the ⊕. **(5)** Then increase the PEEP to 26 cm H_2O. Cancel the settings by tapping the ✕.

    NOTE: The color changes when the settings are changed outside the normal range.

24–26

26 Note

27

VT/PBW

29. Tap **PBW** or the **VT/PBW** to open PATIENT DATA. **(1)**
30. Enter gender **FEMALE**.
31. Enter **HEIGHT** 160 cm.
32. Enter **WEIGHT** 75kg.

    NOTE: The predicted body weight is often not the same as the patient's actual weight (in Neonatal and Pediatric patient categories the actual weight is entered).

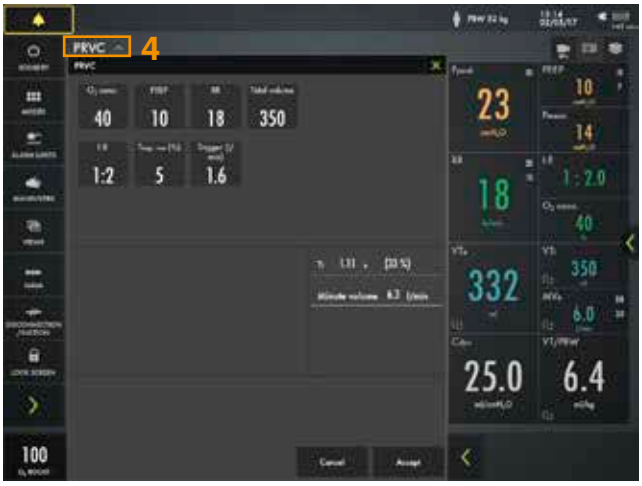
33. Check the ml/kg setting. **(2)**
34. Go to the direct access bar and change the **TIDAL VOLUME** so you receive 6ml/kg. **(3)**

29–33

Mode setting

35. Tap the mode **PRVC** and open the mode setting. **(4)**

34



35

36. Change the **TRIGGER** value to pressure triggering -1 cm H_20.

    NOTE: Read the text by the scaling. Less patient effect and more patient effect. (1)

37. Change the I:E (or Ti if this is configured.)

    NOTE: The changes of the dynamic images.

38. **CANCEL** changes.

39. Make a quick change of O_2 to 100%. Change the O_2 setting in the direct access bar to 100% by tapping on the 100% directly on the sliding scale. **(2)**

40. CANCEL the changes by tapping the ✕.

41. Tap **MODES** in the QUICK MENU and choose PS/CPAP.

42. Change the **END INSPIRATION** to 40 % and then to 60%. Look at how the dynamic image changes.

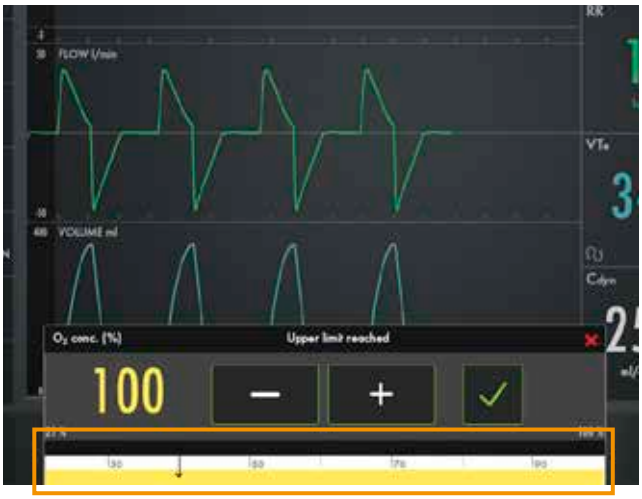
43. **ACCEPT** 60%.

44. **ACCEPT** PS/CPAP mode.

45. Compress the test lung to trigger breaths.

    NOTE: The white indicates the triggering in the waveforms, depending on how the trigger is set (pressure or flow) the colour indication changes - if pressure triggering is set- white indication in pressure waveform. If flow triggering is set- white indication in flow waveform. Also there is a lung on the screen indicating the triggered breath.

36 **1**



39 **2**

45

46. Stop compressing the test lung.

    NOTE: The colour changes to bold white for PC and the BACKUP settings. The mode and settings that are not active are grey. (1)

47. Tap the › in the direct access bar **(2)**, you then have access to all the mode settings directly.

48. Go to **MODES** and change back to **PRVC**.

    NOTE: It is marked previous. (3)

49. Accept previous settings.

46–47

Views

50. Go to **VIEWS** in **QUICK MENU**. **(4)**
    Change to BASIC view.

51. Use the ‹ to find additional values. **(5)**

52. Go through the different views; **DISTANCE, FAMILY, LOOPS** and **SERVO COMPASS**® view.

48

50

53. If SERVO COMPASS view is available, tap on the **SERVO COMPASS**.

    NOTE: You can choose the target for ml/kg and Driving or total pressure.

54. Compress the testlung.

    NOTE: The pressure symbol turns red.

55. Change back to **ADVANCED** view.

56. Go to **SCREEN LAYOUT.**

    NOTE: Here can the SERVO COMPASS be switched on/off (option). (1)

57. Change to filled waveforms by tapping the waveform image. **(2)**

58. Change back to non-filled waveforms.

51

53–54

56–58

Media

59. Tap the **RECORDER** once and tap the **CAMERA** in the status bar three times. **(1)**

    NOTE: A 30 second recording will be made starting 15 seconds before and lasting until 15 seconds after the recording is initiated.

60. Choose **(2)** to access **MEDIA**. Navigate between the different screenshots and the recording.

    NOTE: Screenshots are displayed at the bottom of the window.

61. Find the USB port by flipping the screen.

    NOTE: You can use a USB memory stick to export the data (e.g. screenshots).

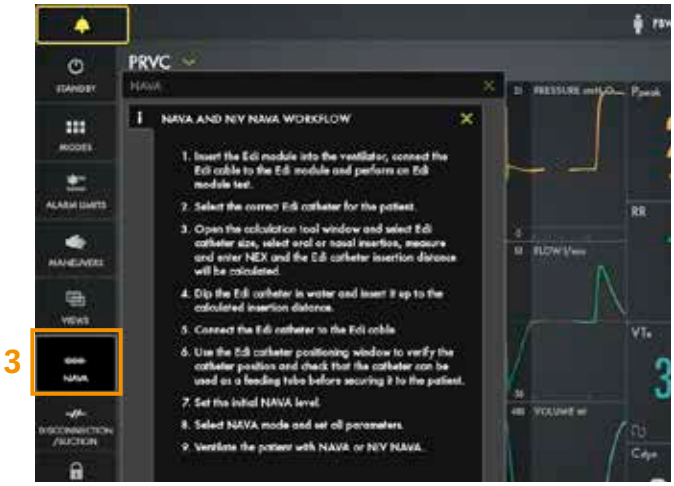
59–60

NAVA & NIV NAVA

62. Go to **NAVA** in **QUICK MENU**. **(3)**
63. Find the workflow of NAVA/NIV NAVA under the **i**.
64. Go to **CALCULATION TOOL**.
65. Chose **16FR EDI CATHETER**.
66. Chose **NASAL** insertion.
67. Enter **NEX** 52 cm.
68. Edi catheter insertion distance is presented.

    NOTE: The insertion distance calculation often needs to be titrated using the ECG.

69. Go to **EDI CATHETER POSITIONING**.



63

64–69

70. Tap the i.

NOTE: The yellow curve is the pressure waveform and the grey curve is the pressure estimated for NAVA.

71. Close by tapping the ✕.

72. Go to **NAVA MODE** and tap i.

NOTE: The mode is divided in NAVA and PC (backup mode).

70

Disconnect/ Suction

73. Go to **DISCONNECT/SUCTION** in **QUICK MENU**. **(1)**

74. Change the **O_2 CONCENTRATION** to 40%. **(2)**

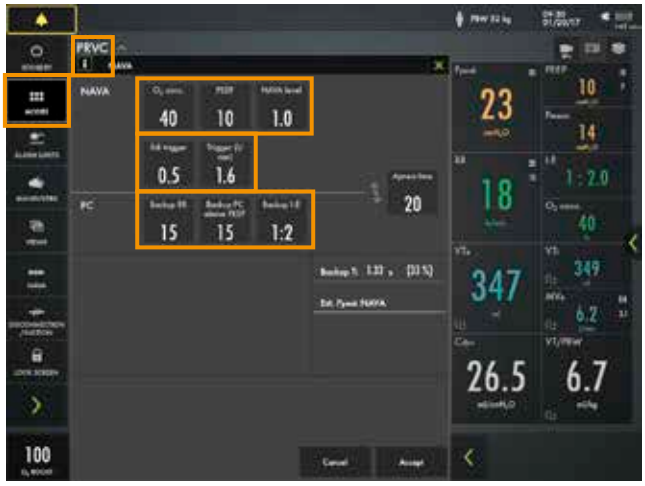
75. Accept **DISCONNECT/SUCTION** function.

76. Disconnect the test lung.

77. Reconnect the test lung.

78. **CANCEL** post-oxygenation.

NOTE: When disconnection/suction is activated the ventilator system is prevented from cycling without activating alarms.



72

73–78

Maneuvers

79. Go to **MANEUVERS** in **QUICK MENU**. **(1)**
80. Activate **MANUAL BREATH** by tapping.
81. Go to **STATIC MEASUREMENT.**
82. Tap **INSPIRATORY HOLD** and hold for 4 seconds, and then **EXPIRATORY HOLD** for 4 seconds. **(2)**
83. Observe the PEEPtot value.

    NOTE: PEEPtot value is the set PEEP + intrinsic PEEP.

84. Go to **NEBULIZATION**.

    NOTE: You can choose continuous nebulization or a nebulization period . The time for nebulization can be changed. When nebulization is activated there will be the corresponding nebulization symbol on the screen. By tapping the symbol you can stop nebulization.

79

81–82

84

Battery

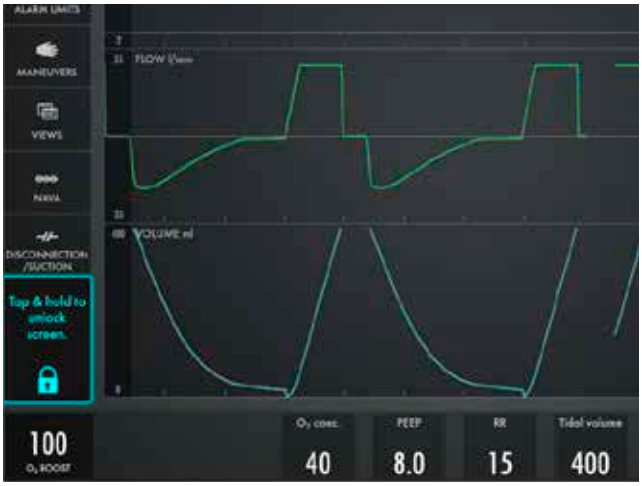
85. Unplug the mains cable.
86. Click on the battery symbol . **(1)**

    NOTE: You can see how much capacity remains for each battery.

86

Lock screen

87. **LOCK** the screen is found in Quick Menu, Lock screen.
88. Tap anywhere on the screen and see what happens.
89. **UNLOCK** the screen by tapping on the Locking Symbol.



87

O_2 boost

90. Activate **O_2 BOOST** by tap and hold. **(2)**

    NOTE: O_2 boost is active for one minute.
91. **CANCEL** O_2 boost by tapping .
92. Go to **MANEUVERS** and select **O_2 BOOST**. Unlock the 100% O_2 boost by tapping the 100% lock symbol.
93. Observe the new **O_2 BOOST** level. Change the **O_2 BOOST LEVEL** to 40% and accept .

90–93

Trends

94. Go to **TRENDS** in the **EXTENDED MENU** ›. **(1)**
95. Change the trend scale to 1 hour. **(2)**
96. Drag the cursor and note that each event/changes have been trended.
97. Tap **ORGANIZE** to change the order of the trends. **(3)**

    Note: Trend values are stored every 60 seconds and retained for a maximum of 72 hours.

98. Put the RR sp, RR at the top by dragging and dropping **TRENDS**.

    Note: You can see the trend of VT/PBW and driving pressure.

99. Close the window by tapping ✕.
100. Tap **MODES**.

     NOTE: You can go directly to HFT without going to Standby.

94

95–96

Stop ventilation

101. Tap **STANDBY** in **QUICK MENU** and then tap and hold **STOP VENTILATION**.

     NOTE: If Edi is connected it is possible to go directly to Edi Monitoring in standby.

101

Knowledge check

1. Why is it important to have the same patient circuit that will be used for the patient when performing the patient circuit test?

2. Which priority level does the red alarm have? HIGH, MEDIUM or LOW priority?

3. Can autoset of alarm settings be used in supported modes?

4. Is pressure Triggering of -1 easier or more difficult than Flow triggering of 1.6 l/min. (for the patient to trigger the breath)?

5. Is the end inspiration of 40% expiration longer or shorter than 60%? Look at the dynamic image and text.

6. How can you see on the screen that the patient is triggering?

Answers

1. If the correct circuit is not tested, the following risks may arise:
   - In volume-based modes, the volume delivered to the patient will be incorrect.
   - In pressure-based modes, the volume measured will be incorrect.
2. Red – High Priority alarms. Yellow – Medium priority alarms. Blue – Low priority alarms.
3. Autoset is not available in supported or NIV modes or in STANDBY because the ventilator system requires patient values in order to propose alarm limits.
4. Flow triggering of 1.6l/min is easier to trigger the breath than pressure triggering of -1.
5. End inspiration of 40% gives a longer inspiration than 60%.
6. There is a lung on the screen indicating the triggered breath. Also there is a white indication in the waveforms. (if pressure triggering is set- white indication in pressure waveform and if Flow triggering is set- white indication in flow curve).

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Getinge is a leading global provider of innovative solutions for operating rooms, intensive-care units, hospital wards, sterilization departments and for life science companies and institutions. Based on first-hand experience and close partnerships, Getinge offers innovative healthcare solutions that improve every-day life for people, today and tomorrow.

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www.getinge.com

POLICY: Tracheostomy Care

I. POLICY: This standard serves as a guide for caregivers caring for infants/children with a tracheostomy (trach). The guidelines provide a consistent framework to guide care to ensure we maintain patency of the artificial airway, maintain skin integrity, prevent accidental dislodgement or occlusion of the trach and prevent infection.

II. SEE ALSO:

Respiratory Therapy Policy:

D.1 Mechanical Ventilation

F.2 Cleaning of trachs

F.3 Tracheal Decannulation/Passy Muir

9-b-Ventilated Resident/Patient with Closed Suction System

III. RESPONSIBILITY

A. The nurse will perform all skills required for a patient with a tracheostomy including suctioning, chest physiotherapy, provision of humidification and /or respiratory support, changing of tracheostomy ties/ holder and tube as necessary

B. Respiratory Therapist will assist nursing in the assessment and cares for a child with a tracheostomy including but not limited to: administration of prescribed aerosol therapies; suctioning ; Cough-assist and Chest physiotherapy; provision of humidification and /or respiratory support, changing of tracheostomy ties/ holder and tube as necessary

C. ***IMPORTANT NOTE: The first tracheostomy change on all new surgical tracheostomies will be performed prior to admission.***

III. ESSENTIAL STEPS IN PROCEDURE	**KEY POINTS**

Special considerations: • All children must have an extra (appropriately sized) trach, one smaller sized trach, trach ties, suction equipment and ambu bag/mask at bedside (or when traveling off unit) at all times. • Bivona tracheostomies contain metal and may not be compatible with MRI's.	After trach placement, obturator is maintained at bedside.
A. Humidification: 1. If room air is ordered: Connect nebulizer and bottle of sterile water to a flow-meter connected to medical air source (yellow tubing). Set flowmeter at >5L/min and nebulizer dial at 40% marking. 2. If oxygen is ordered: connect nebulizer and sterile water to a flowmeter connected to oxygen source (green tubing). Set flowmeter and oxygen concentration as ordered. 3. Either of the above humidification systems are connected to the patient blue corrugated tubing and tracheostomy collar with swivel T connector. 4. Heat Moisture Exchange (HME) should be used as per MD/NP orders as directed.	Patients/Residents with tracheostomies should be provided with a source of humidification to prevent drying of the secretions
IV. ESSENTIAL STEPS IN NURSING PROCEDURE	**KEY POINTS**
B. Skin Care 1. Skin care is provided Q 24 hours or more frequently if necessary. 2. Clean area around stoma with normal saline soaked gauze. Dry thoroughly after cleaning. 3. Apply medicated ointments ONLY as per MD/NP order. 4. Application of absorbent pads under trach ONLY as per MD/NP order. Change when moist/damp.	Routine use of ointments or creams to skin around stoma is not common practice. Use of powders should be avoided in children with tracheostomies. Gauze pads should NOT routinely be placed under trach unless ordered to do so. Pads tend to get moist and are a breeding ground for micro-organisms.

C. Changing Tracheostomy ties /holder 1. Tracheostomy ties are changed once a day and when soiled PRN 2. Two care providers are present when tracheostomy ties are changed.	Care providers to assist RN can include: Respiratory therapist, RN, Nursing Assistant, and trained care givers of patient
3. Position patient/resident with blanket roll under shoulders. 4. For older child, Consider positioning child in Semi-fowler's position with head tipped back.	This position will hyperextend neck and allow better visualization of and access to the trach tube.
5. Suction patient/resident and clean site as necessary.	Excess mucus will make trach tube slippery to hold.
6. The ties are tightened until the index finger can fit snugly under the holder. .Patient/resident should be in a sitting position for this measurement	Proper tightness is important to prevent dislodgement and skin breakdown. See picture in appendixes
D. Changing Inner cannula 1. Don gloves. 2. Disconnect trach-collar or ventilator 3. Using sterile technique, suction if needed 4. Remove inner cannula 5. Insert new inner cannula and lock position 6. Reapply trach-collar or ventilator. 7. Assess and document patient/resident tolerance of procedure.	To prevent dislodgement of inner cannula and/or tracheostomy. Inner cannula is to be changed once per Day or more frequently as needed.

E. Changing Tracheostomy tube: • Tracheostomy tubes will be changed as specified by MD/NP orders and PRN. • If child has a tracheostomy with an inner cannula: Inner Cannulas will be changed daily.	
1. Verify new trach tube to be inserted is the correct size. 2. Wash hands and don proper protective personal protective equipment.	Internal and External diameter sizes are printed on the trach flange.

3. Prepare new trach tube ensuring trach tip is kept sterile. Apply new Velcro ties to trach and secure through the flange. Leave Velcro ties unfastened in the back.	Sterile technique is used for trach change in the hospital setting. In the home care environment, clean technique may be utilized.
4. Obturator is used for insertion, place obturator into new trach tube prior to insertion and remove promptly after placement.	
5. If Trach tube is a cuffed tube, validate integrity of cuff by inflating with air prior to insertion. (Deflate fully before inserting)	
6. Suction trach tube as needed prior to change.	Throughout trach tube change monitor child's vital signs, O2 saturations, and ventilatory effort
7. Position patient with blanket roll under shoulders. Or older children, offer the option of sitting in bed with head extended backwards.	Stoma should be easily visible and accessible.
8. If trach tube is a cuffed tube- deflate cuff before removal.	
9. Two caregivers are present during planned tracheostomy tube changes.	Caregivers must communicate their readiness to remove/reinsert trach. Throughout trach tube change monitor child's vital signs, O2 saturations, and ventilatory effort

10. Obturator is removed, ties are fastened behind neck. O2 or ventilatory support is reattached to trach as necessary.	See Appendices
11. Breath sounds are auscultated bilaterally and a respiratory assessment is completed.	
12. Trach ties are checked for proper tightness as described above.	See Appendices
G. SUCTIONING TRACHEOSTOMY with open suction with sterile catheter	

1. Explain procedure to child/family. Enlist additional personnel as needed. 2. Monitor Vital signs, ventilation and need for assisted ventilation or supplemental O2 before, during and after the procedure. 3. Select appropriate size suction catheter 4. Determine insertion depth of catheter. a. Measure from opening to tip of trach with suction catheter (markings on side of catheter) b. Add 0.5-1.0 cm to distance calculated in step above to ensure catheter passes trach opening but avoids hitting carina. 5. Suction utilizing sterile technique 6. Disconnect from ventilator or O2 source, hyperventilate as needed. 7. Insert catheter to the pre-measured numerical marking of catheter. 8. Once you have reached proper insertion depth, Cover suction port with thumb and withdraw catheter, turning it in a circular motion. 9. Administer O2 or hyperventilate as needed. 10. Assess need for repeated passage of suction catheter. 11. Assess vital signs and respiratory status pre, intra and post suctioning. Document response and tolerance.	Appendixes chart for selecting the proper size catheter for different trach sizes. Recommended wall suction pressure: Infant= 50-100 mmHg Child = 80-120 mmHg Teen/Young Adult = 100-120 mmHg DO NOT apply suction to catheter during insertion. Routine installation of Normal saline (NS) flush is contraindicated. Assess the need to administer a small amount of NS into trach prior to suctioning to facilitate secretion removal.

V. DOCUMENTATION (All clinical staff):

A. All assessment data, interventions, outcomes and patient response

B. All teaching done and patient/resident/family response to and understanding of teaching.

VI. Child and Family Education

A. RNs provide education regarding the care and management of a tracheostomy by demonstration while the child and/or family observes, assessing the child and/or family skills during return demonstration and teach back methods. Consult with the Child and Family Education Coordinator to request further education as needed.

B. Recommended practice considerations for the child and/or family

1. Open suction is a no touch contamination/clean procedure in the home setting. Caregiver training does not require sterile glove technique or use.
2. Caregivers are trained to maintain and have present at all times with the child the "Emergency Trach Go Bag".

References

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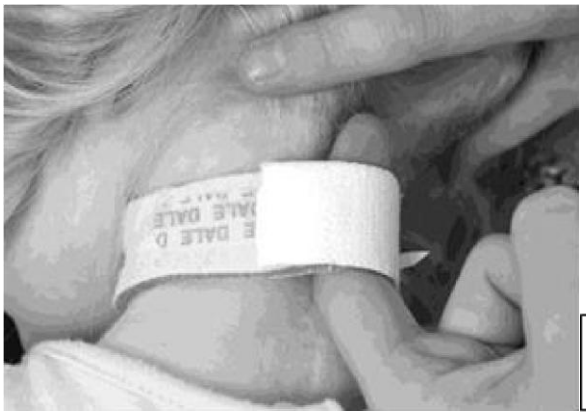
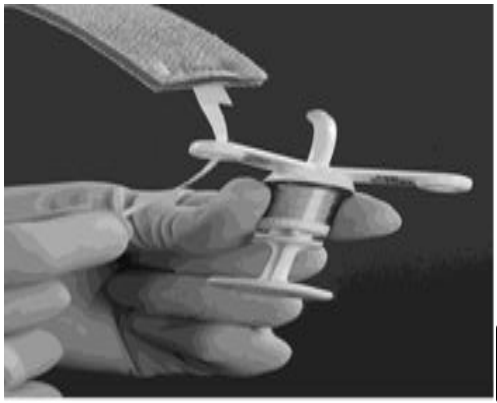
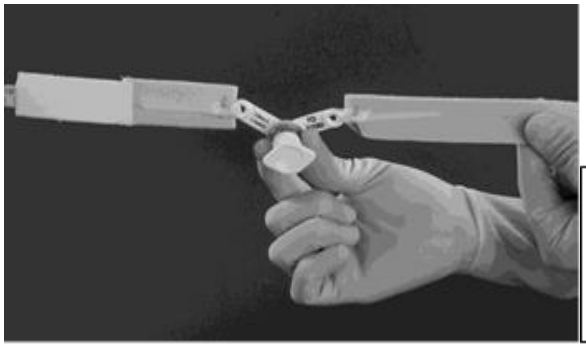
Appendix



One finger should fit snuggly underneath tie to ensure tie is not too loose or too tight.



Insert new trach with obturator in place.



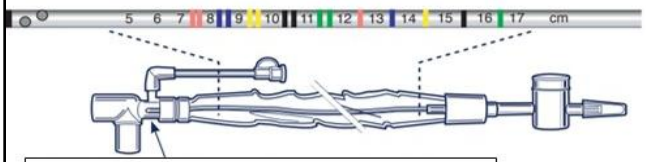
It facilitates securement if new Velcro ties are pre-attached to new trach. Prior to insertion.

SHILEY TRACHS	SX CATH French (FR)	SX DEPTH OPEN	SX DEPTH CLOSED
NEO 3.0	6 or 8 FR	6 cm	8 cm
NEO 3.5	6 or 8 FR	6.5 cm	8.5 cm
NEO 4.0	6 or 8 FR	6.5 cm	8.5 cm
NEO 4.5	6 or 8 FR	7 cm	9 cm
PEDS 3.0	6 or 8 FR	7 cm	9 cm
PEDS 3.5	6 or 8 FR	7.5 cm	9.5 cm
PEDS 4.0	8 FR	7.5 cm	9.5 cm
PEDS 4.5	8 FR	7.5 cm	9.5 cm
PEDS 5.0	10 FR	7.5 cm	9.5 cm

SHILEY TRACHS	SX CATH French (FR)	SX DEPTH OPEN	SX DEPTH CLOSED
PEDS 5.0 PDL	10 FR	8.5 cm	10.5 cm
PEDS 5.5	10 FR	8 cm	10 cm
PEDS 5.5 PDL	10 FR	8.5 cm	10.5 cm
PEDS 6.0 PDL	10 FR	9 cm	11 cm
PEDS 6.5 PDL	10 FR	9 cm	11 cm
ADULT 4.0	10 FR	9.5 cm	12 cm
ADULT 6.0	14 FR	11 cm	13 cm
ADULT 8.0	14 FR	12 cm	14 cm

Closed Suction Catheter Color

7.0 cm = Double Red	12.0 cm = Solid Red
8.0 cm = Double Blue	13.0 cm = Solid Blue
9.0 cm = Double Yellow	14.0 cm = Solid Yellow
10.0 cm = Double Black	15.0 cm = Solid Black
11.0 cm = Double Green	16.0 cm = Solid Green



Visualize depth for number and color in dome

Guidelines for Suction Pressure:

- Infants: 80 - 100 mm Hg
- Children: 100 - 120 mm Hg
- Adults: 100 - 150 mm Hg

1. Occlude the tubing while setting suction pressure
2. Check suction pressure before every suction event

Deep suction and saline lavage are no longer recommended.

Incorrect technique will cause tissue trauma, bleeding, infection, and traumatic atelectasis

Source: American Association for Respiratory Care

Blythedale children's hospital

BIVONA TRACHEOSTOMY SUCTION CARD

Standard	French (FR)	DEPTH OPEN	DEPTH CLOSED
NEO 2.5	6 FR	6 cm	8 cm
NEO 3.0	6 or 8 FR	6.5 cm	8.5 cm
NEO 3.5	6 or 8 FR	6.5 cm	8.5 cm
NEO 4.0	6 or 8 FR	7 cm	9 cm
PEDS 2.5	6 FR	7 cm	9 cm
PEDS 3.0	6 FR	7 cm	9 cm
PEDS 3.5	6 or 8 FR	7.5 cm	9.5 cm
PEDS 4.0	8 FR	7.5 cm	9.5 cm
PEDS 4.5	8 FR	7.5 cm	9.5 cm
PEDS 5.0	10 FR	7.5 cm	9.5 cm
PEDS 5.5	10 FR	8 cm	10 cm

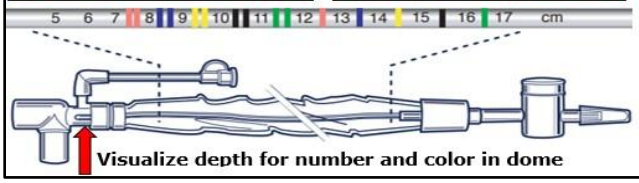
FlexTend	French (FR)	DEPTH OPEN	DEPTH CLOSED
NEO 2.5	6 FR	8.5 cm	10.5 cm
NEO 3.0	6 or 8 FR	8.5 cm	10.5 cm
NEO 3.5	6 or 8 FR	9 cm	11 cm
NEO 4.0	6 or 8 FR	9.5 cm	11.5 cm
PEDS 2.5	6 FR	9.5 cm	11.5 cm
PEDS 3.0	6 FR	9.5 cm	11.5 cm
PEDS 3.5	6 or 8 FR	10 cm	12 cm
PEDS 4.0	8 FR	10 cm	12 cm
PEDS 4.5	8 FR	11 cm	13 cm
PEDS 5.0	10 FR	11 cm	13 cm
PEDS 5.5	10 or 12FR	11.5 cm	13.5 cm

FlexTend Plus	French (FR)	DEPTH OPEN	DEPTH CLOSED
PEDS 4.0	8 FR	11 cm	13 cm
PEDS 4.5	8 FR	11.5 cm	14 cm
PEDS 5.0	10 FR	12 cm	14 cm
PEDS 5.5	10 or 12FR	12 cm	14 cm
PEDS 6.0	10 or 12FR	12.5 cm	14.5 cm

Disconnect Wedge maintained at bedside at all times

Closed Suction Catheter Color Depths

7.0 cm = Double Red	**12.0 cm = Solid Red**
8.0 cm = Double Blue	**13.0 cm = Solid Blue**
9.0 cm = Double Yellow	**14.0 cm = Solid Yellow**
10.0 cm = Double Black	**15.0 cm = Solid Black**
11.0 cm = Double Green	**16.0 cm = Solid Green**



Visualize depth for number and color in dome

Guidelines for Suction Pressure:

- Infants: 80 - 100 mm Hg
- Children: 100 - 120 mm Hg
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1. Occlude the tubing while setting suction pressure
2. Check suction pressure before every suction event

Deep suction and saline lavage are no longer recommended.

Incorrect technique will cause tissue trauma, bleeding, infection, and traumatic atelectasis

Source: American Association for Respiratory Care

POLICY: Volara™ System

SCOPE:

The Volara™ System (Volara) is an alternative to conventional chest physical therapy to promote the clearance of respiratory secretions in individuals with impaired ability to cough or otherwise expel them on their own.

PURPOSE:

The Volara provides therapy to enhance secretion mobilization and helps prevent or resolve patchy atelectasis. Patients/residents who may benefit from the Volara include those with one or more of the following disease states: Bronchiolitis, Cystic Fibrosis, Asthma, Chronic Bronchitis, Bronchiectasis, Neuromuscular Disorders and patients/residents who need Post-Operative Airway Management.

DEFINITIONS:

The Volara™ System is intended for mobilization of secretions, lung expansion therapy, the treatment and prevention of pulmonary atelectasis, and also has the ability to provide supplemental oxygen when used with an oxygen gas source. The system delivers therapy in two (2) modes:

1) Continuous High Frequency Oscillation (CHFO) for the delivery of medicated aerosol while oscillating the airways with continuous pulses of positive pressure.

2) Continuous Positive Expiratory Pressure (CPEP) for the delivery of medicated aerosol combined with continuous positive pressure to assist in holding open and expanding the airways.

POLICY:

The Volara may only be used with an order from a physician/nurse practitioner (NP). The Volara will be able to maintain a clear airway by mobilization of secretions, lung expansion therapy, the treatment and prevention of pulmonary atelectasis.

The following procedure outline set in this policy are for non-ventilated and ventilated patients/residents.

PROCEDURE:

<u>Absolute Contraindications</u>

The Volara System is contraindicated if the following conditions are present:

1. Untreated tension pneumothorax.

Relative Contraindications

The decision to use the Volara System in the presence of the conditions listed below requires careful consideration and assessment by the ordering physician/NP of the individual patient/resident's case.

1. History of pneumothorax
2. Pulmonary air leak
3. Recent pneumonectomy
4. Pulmonary hemorrhage
5. Myocardial infarction
6. Vomiting

Possible Adverse Reactions

Use of the Volara System should be evaluated or modified if the following circumstances occur:

1. Hyperventilation
2. Gastric distension
3. Decreased cardiac output
4. Increased intracranial pressure
5. Increased air trapping
6. Hyper oxygenation
7. Pneumothorax
8. Pulmonary air leak
9. Pulmonary hemorrhage

The Volara shall be initiated with a written order by the Physician/NP

TREATMENT CHECKLIST - NON-VENTILATED **(White Cone)**

1. Get All Equipment
    a. Single Patient Use (SPU) Proprietary Circuit for the Volara System including the SmartFilter.
2. Follow Blythedale Children's Hospital's (BCH) infection control precautions.
3. Introduce yourself and explain procedure to patient/resident and parent.
4. Patient/resident should be in an upright and comfortable position unless contraindicated.
5. Assess patient/resident per BCH guidelines.
6. Assemble The Volara circuit correctly with:
    a. Tracheostomy
    b. Facemask

c. Mouthpiece

7. Attach O2 bleed-in adaptor, if applicable
8. Fill nebulizer with prescribed medications, **if applicable.**
9. Connect circuit and nebulizer to the control unit
10. Turn on device
11. Select Automatic mode
12. Tap on arrow on right side and middle of the screen.
13. Tap on the lung to locate therapy care plans.
14. Select appropriate therapy care plan, (Low, Medium, or High)

Pre Set	Stages	Therapy	Pressure	Time	Frequency
Low	1	CPEP	5	2.5	-
	2	CHFO	15	2.5	Med
	3	CPEP	5	2.5	-
	4	CHFO	15	2.5	Med
Pre Set	Stages	Therapy	Pressure	Time	Frequency
Medium	1	CPEP	8	2.5	-
	2	CHFO	20	2.5	Med
	3	CPEP	8	2.5	-
	4	CHFO	20	2.5	Med
Pre Set	Stages	Therapy	Pressure	Time	Frequency
High	1	CPEP	10	2.5	-
	2	CHFO	25	2.5	Med
	3	CPEP	10	2.5	-
	4	CHFO	25	2.5	Med

15. Place the device on the patient/resident (i.e. mask, mouthpiece, and Tracheostomy adapter).
16. Press START to begin therapy.
17. Encourage patient/resident to exhale slowly (3-4 seconds).
18. Encourage patient/resident to gently cough up secretions as they mobilize into the upper airways.
19. Use the PAUSE button to pause therapy, if needed (i.e. suction, cough)
20. STOP or RESUME therapy.
21. Once therapy and the cycle have completed, disconnect delivery device from the patient/resident.

22. Monitor and document patient/resident's tolerance during and after the treatment.
23. Empty the medication from the nebulizer and store Single Patient Use (SPU) Circuit
24. Follow BCH Policy and Procedure for infection control.

IN-LINE TREATMENT CHECKLIST – VENTILATED **(Blue Cone)**

1. Get All Equipment
    a. Single Patient Use (SPU) Circuit for the Volara System including the SmartFilter.
    b. Controller System (includes mobile stand and power cord)
2. Follow Blythedale Children's Hospital's (BCH) infection control precautions.
3. Introduce yourself and explain procedure to patient/resident and parent.
4. Patient/resident should be positioned to maintain HOB ≥ 30° unless contraindicated.
5. Assess patient/resident per BCH guidelines.
6. Assembles circuit correctly in-line with the ventilator.
7. Prepare handset for in-line use by removing the clear cone adapter and replacing it with the blue in-line cone adapter.
8. Attach O2 bleed-in adapter, if applicable.
9. Put a spring valve 'tee' adapter into the wye "Y" side of the inspiratory limb or the dry side of the ventilator circuit.
10. Connect circuit to the control unit.
11. Turn ON the device.
12. Select Manual mode
13. Screen would appear for manual settings
14. Turn off Nebulizer on the Volara
15. Select appropriate therapy:
    a. Minimum Pressure setting is 25cmH2O
    b. If patient/resident's spring valve 'tee' adapter is set-up at the "Y" increase pressure 5cmH2O above PIP
    c. If patient/resident's spring valve 'tee' adapter is set-up at the dry end of the circuit increase pressure to10cmH2O above PIP
16. Confirm therapy plan is delivering only CHFO.
17. Alarm parameters may need to be adjusted before using the Volara System in-line.

18. The Volara System may be used in any of the following modes of ventilation: AC VC, AC PC, SIMV VC, SIMV PC, PSV, PRVC & APRV / BiLevel / BiVent. Because the Volara System adds flow to the circuit, adjustments may be needed to avoid auto cycling and volume alarming. If the ventilator mode is changed, make sure that the minute volume is maintained. Follow the Volara device setting guidelines for adult and pediatric patients respectively. Initiate therapy at 5-10 cm H20 above PIP.
19. Press START to begin therapy.
20. **Allow the device to "ramp up" (8-10 seconds), before connecting the handset.**
21. Use the 15mm x 22mm adapter to connect the handset to the spring-valve 'tee' adapter located on the inspiratory limb of the ventilator circuit.
22. Insert the Volara System handset into the spring-valve tee adapter.
23. Suction secretions as necessary during treatment. Do not leave the patient/resident during therapy and be prepared to suction.
24. When treatment is complete, locate STOP to end therapy.
25. Remove the Volara System handset and cap spring-valve tee adapter.
26. Remove 'tee' adapter from the inspiratory limb of the ventilator circuit.
27. Monitor and document patient/resident's tolerance during and after the treatment.
28. Return the ventilator alarms and modes to their previous settings.
29. Empty the medication from the nebulizer and store Single Patient Use (SPU) Circuit
30. Follow BCH Policy and Procedure for infection control.

REFERENCES:

Hill-Rom Volara ™ System Instruction for Use Product No. PVL1: 196654 REV 7