Precautions in case of suspected/confirmed COVID-19 20/03/2020

Infection with SARS COV2 is likely to result in some requirement for inter hospital critical care transport. The precautions below are to be considered in conjunction with current HPSC guidance and the MICAS COVID-19 transport checklist.

Transport of Critically Ill suspected/confirmed COVID-19 Cases

In any confirmed/suspected case of COVID-19, the decision to transfer should be carefully evaluated in terms of risk and benefit to the patient and in the context of the prevailing national situation.

MICAS will undertake any necessary transfers of critically ill suspected/confirmed COVID-19 cases within the usual operating procedures.

All such cases will be discussed with a senior member of the NASCCRS/MICAS team in addition to the usual consultant to consultant referral process. Any requirement to change the destination of the patient en route must be discussed with the National Ambulance Service Critical Care Retrieval Desk.

A clear path to and from the ambulance should be identified prior to departure. This should involve security or other staff at the receiving hospital in order to ensure no delay and to minimize risk.

Non-critically ill transfers will be undertaken by the National Ambulance Service.

Infection Prevention and Control Measures

All standard HPSC recommended practices should be adhered to, noting that intubation, ventilation and suctioning are high risk procedures.

The HPSC provides guidance on infection prevention and control in the context of COVID-19: https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/Infection%20Prevention%20and%20Control%20Guidance%20for%20novel%20coronavirus%20MERS%20and%20Avian%20Influenza%20V2.0.pdf

The WHO specifically recommends separation of the driver and patient compartments in the ambulance (e.g. by ensuring that the sliding window between the two is tightly closed). It is likely that this is most important in the case of a non-intubated patient where droplet spread may be more likely: https://apps.who.int/iris/bitstream/handle/10665/112656/9789241507134_eng.pdf?sequence=1&isAllowed=y

The WHO also recommends that transport vehicles have as high a volume of air exchange as possible (e.g. by opening the windows), however this may generate turbulent airflow and paradoxically therefore increase risk. **Routine opening of windows in transport is therefore not recommended.**

During patient transportation it is recommended that air conditioning or ventilation on ambulance vehicles be set to 'extract' and therefore **it is advised to not recirculate the air within the vehicle.**

Post transportation it is advised the vehicle be left to ventilate with windows open and extractor fan set to 'extract.'

Specific Precautions in the Case of a Ventilated suspected/confirmed COVID-19 case

The HSCP guidance includes recommendations on ventilator use:

- If on a critical care unit, the patient should be nursed in a negative pressure isolation room where available, or if not available, a neutral pressure side room with a closed ventilator circuit should be used.
- All respiratory equipment must be protected by a filter with high efficiency e.g. BS EN ISO 23328-1:2008
- Disposable respiratory equipment should be used wherever possible. Re-usable equipment must be decontaminated in accordance with the manufacturer's instructions.
- Ventilator circuits should not be broken unless absolutely necessary.
- Ventilators must be placed on stand-by when carrying out bagging.
- Water humidification should be avoided and a heat and moisture exchange filter should be used if possible.
- Use only closed system suction.

While bagging of the patient should be avoided if possible, a viral HME filter should be used on the BVM or C-circuit if this is necessary.

The HPSC does not (as of 14th February 2020) provide specific guidance on the use of a filter on the expired air circuit of ventilators.

The WHO recommends the use of a bacterial and viral filter on the exhalation valves of ventilators used on patients with acute respiratory infections of potential concern:
https://apps.who.int/iris/bitstream/handle/10665/112656/9789241507134_eng.pdf?sequence=1&isAllowed=y

Hamilton Medical also endorses this procedure:
https://www.hamilton-medical.com/dam/jcr:14746981-289b-4c71-94ee-0a60dc46eefd/135_Safe%20use%20of%20Hamilton%20Medical%20ventilators%20for%20patients%20with%20highly%20infectious%20diseases.pdf

While the Hamilton T1 ventilator does not cycle expired gases through the ventilator, the addition of an expiratory viral filter may offer an additional level of security to staff in transport, in the event that the proximal filter becomes impaired.

We would therefore also recommend the use of an expiratory filter on all ventilated patients in transport. This recommendation is in keeping with interim guidance issued by us on 4th February 2020 and also the guidance issued by the Intensive Care Society of Ireland on 8th February 2020. This practice also offers an additional layer of protection to the team in the event of compromise of the proximal filter for any reason.

If switching ventilators in preparation for transport, the ventilator should typically be placed in standby mode prior to disconnecting from the patient in order to prevent mucus dispersion from the circuit. **Care should be taken that the ventilator is not accidentally placed out of standby mode.**

ETT cuff pressure should be checked to ensure no leak.

Consideration should also be given to clamping the endotracheal tube to minimize any mucus dispersion from the patient if clinically appropriate. Beware that repeated clamping of the endotracheal tube, may cause it to crack.

Used ventilator circuits should also be disposed of carefully after use.

Aerosol Generating Procedures (AGPs)

Certain procedures (including intubation and suctioning) are considered aerosol generating procedures. Where possible, the ambulance should be stopped and windows opened if an AGP is necessary. This theoretically maximizes ventilation in the ambulance as long as weather conditions do not create turbulent air flow.

NIV, High Flow nasal oxygen and humidification should be avoided.

Clinical Transfer

The retrieval team should give/obtain handover prior to entering the patient room. Any unnecessary equipment should be removed from the patient compartment of the ambulance.

Once the patient is on the critical care trolley at the referring hospital, the retrieval team should doff their PPE, decontaminate and attend to personal hygiene and hydration prior to donning fresh PPE on leaving the patient room and prior to moving towards the ambulance.

Of note, the retrieval team will not be able to use their mobile phones in transfer – these could be given to the driver in advance if a call is felt to be necessary or else placed in a plastic bag and used on speaker mode.

The use of security personnel should be sought to expedite passage through the hospital and to avoid pressing lift buttons, door handles etc.

Decontamination

On arrival at the receiving hospital, once the ambulance is stationary and empty, leave the doors and windows of the patient compartment open for at least 20 minutes (longer if possible, but this is not an absolute requirement).

This is likely to allow dispersal of any droplets that remain suspended in the air within the patient compartment and aid dispersal of any aerosols generated.

Following handover of the patient, where possible, the trolley and staff should remain in the closed patient room for 20 minutes post disconnection of the ventilator. The team should then clean the trolley in the room (or an ante room if available).

If this is not possible due to space, the trolley should be cleaned as much as possible in the room/ante room and then again at the ambulance.

The NAS ambulance decontamination guidelines should be followed. There is no requirement for PPE beyond disposable gloves and apron at this stage as droplets can be expected to have settled.

The ambulance should be cleaned using NAS recommended products and procedure. Any clinical equipment used should similarly be decontaminated.

Any cupboards opened in the course of the transfer should be cleaned in the same manner.

The ambulance should be fully cleaned prior to returning to base as a team member or members will be in the patient compartment.

PPE

PPE is provided for staff. This is stored both inside and outside the ambulance (therefore accessible from both locations). The NAS Intermediate Care Operative requires 2 sets of PPE in order to doff prior to driving and don again on arrival at the receiving hospital. A minimum of 8 sets of PPE will be required on the ambulance to allow for damage/error in application.

Once the team has completed their assessment of the patient and transfer of patient onto the critical care trolley, they should doff PPE and don a new set of PPE prior to leaving the patient room, or in the ante room if available.

The NAS EMT/Paramedic driving the ambulance should doff their PPE prior to commencing journey and don a new set of PPE on arrival at the receiving hospital.

Viral and Bacterial Filters

The standard BS EN 13328-1:2001, previously mentioned in both HSPC and ICSI guidance, was withdrawn from use (in 2008) and replaced with BS EN ISO 23328-1:2008 (which is now the filter mentioned in the guidance). The filters currently used by MICAS with the Hamilton T1 ventilator are fully tested to conformance with the current standard BS EN ISO 23328-1:2008.

The filters supplied for use on the Hamilton T1 transport ventilator are compatible with this standard. Two are available:

Importantly, the filter cap must be closed and upright to ensure no leakage.

A. HME Viral and Bacterial Filter (Armstrong Pharma Mini HME Bacterial Viral Filter)

This is the filter that **must** be used at the proximal end of the circuit closest to the patient/endotracheal tube. It offers HME function as well as bacterial and viral filtration.

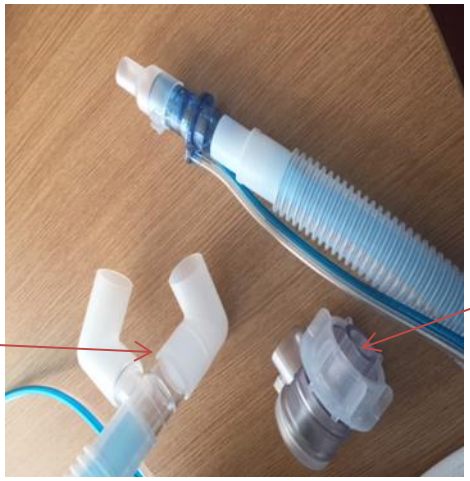
B. Viral and Bacterial Filter only (Armstrong Pharma Bact Trap Mini Port)

This filter does not offer any HME function. Either this filter or the HME filter above can be used at the distal end of the circuit closest to the ventilator itself.

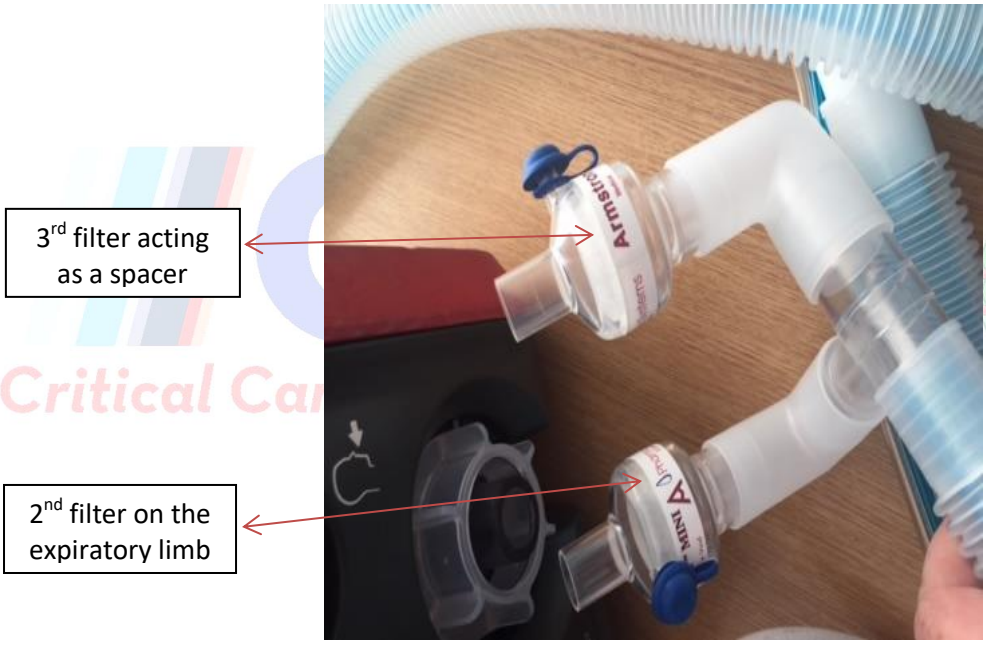
Use of second filter on the Expiratory Limb of the Hamilton T1 ventilator circuit

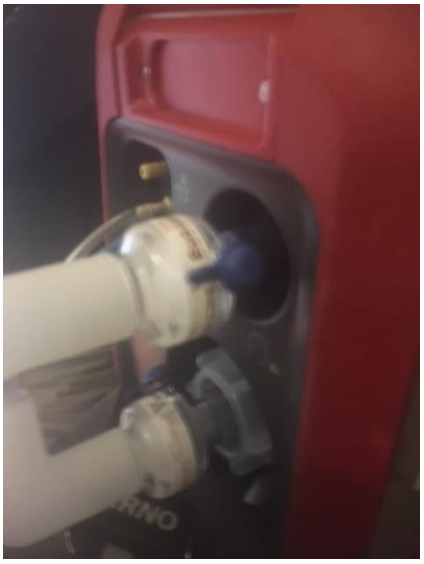
The method of using a second filter (on the expired limb of the Hamilton T1 ventilator tubing) is explained below.

1. The second filter needs to be inserted at the distal end of the tubing. It cannot be inserted distal to the expiratory valve so must be inserted immediately proximal to the expiratory valve (between the expiratory valve and the 'Y' connector).



2. Due to the rigid 'Y' connection of the Hamilton T1 ventilator tubing, if a second filter is added to the expiratory limb, a third filter is actually required to act as a spacer. It is not necessary for either of these filters to have HME function.





Both 2nd and 3rd filters in position connected to the ventilator

3. Normal standards of care apply regarding ventilation (i.e. ETCO2, inline suction catheters and HME filter (Mini Pharm) at proximal end of ventilator).

Flow sensor ETCO2, inline suction and HME should be added proximal to patient

4. In the event that a dual limb circuit is preferred, the expiratory valve and flow sensor can be removed from the Hamilton coaxial circuit and added to any dual limb circuit. This would permit the use of the second filter on the expiratory limb without the need for a third spacer filter.

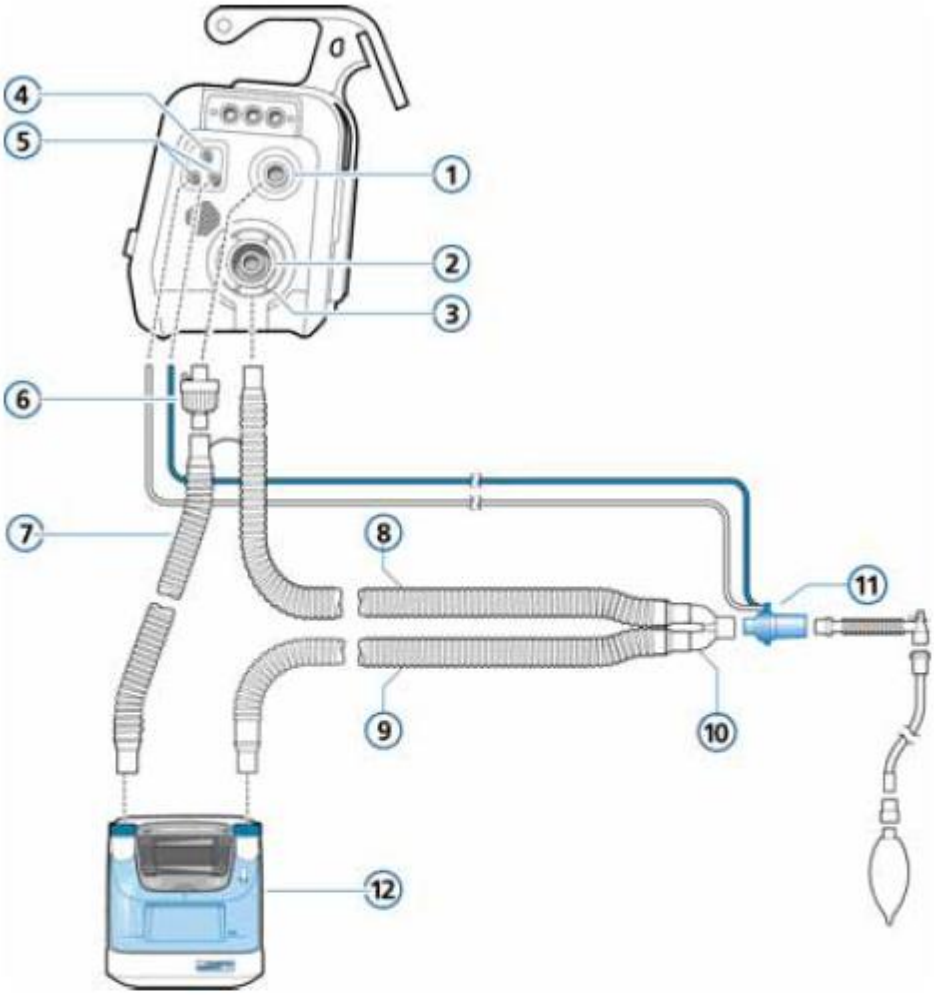


Figure 2-4. Dual-limb breathing circuit with humidifier (adult/pediatric)

1	To patient	**7**	Inspiratory limb
2	From patient	**8**	Expiratory limb
3	Expiratory valve with membrane cover	**9**	Inspiratory limb (with integrated heater wire)
4	Nebulizer outlet	**10**	Y-piece (integrated with breathing circuit)
5	Flow sensor connectors	**11**	Flow sensor
6	Bacteria filter	**12**	Humidifier

In some cases, an elbow adaptor may be useful between the inspiratory filter and

Schematic demonstrating dual limb circuit connection. NB although humidifier is included here, this is not recommended.