Irish Paediatric Acute Transport Service

Clinical Guideline

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Related Documents:	

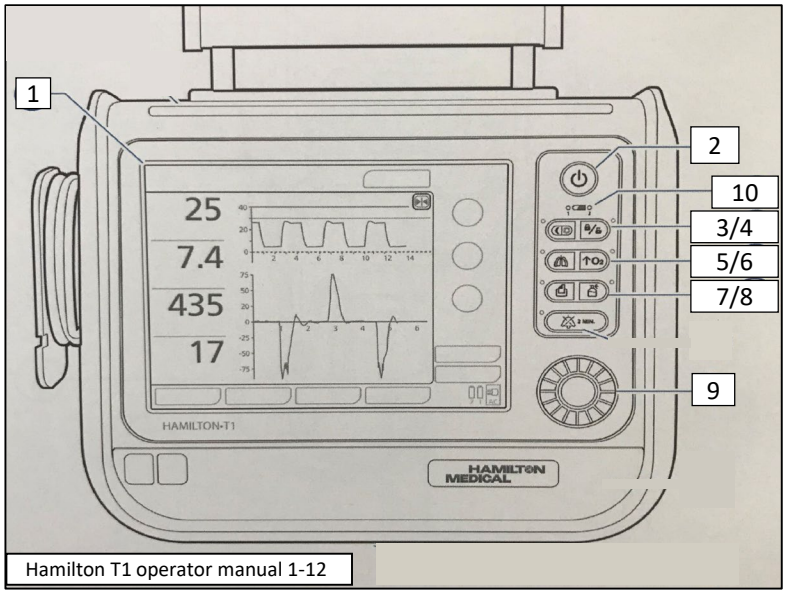
The Irish Paediatric Acute Transport Service (IPATS) has produced this clinical guideline. It has been designed for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children.

This guideline represents the views of IPATS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.

Hamilton T1 Paediatric Invasive Ventilation Guideline

(This is not intended to replace the manufacturers guideline and is an aide-memoir only)

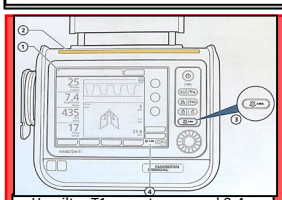
- Time cycled volume/Pressure controlled paediatric & adult ventilator
- Designed for infants of >200gm (2ml min Tv) through to adults 139Kg (2000L Tv)



Hamilton T1 operator manual 1-12

"Knobology"

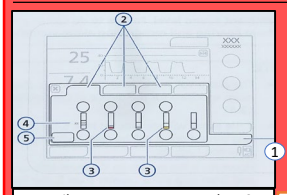
1. **Touch screen –** Provides access to measurements & controls
2. **Power/standby key –** Press for 0.3sec. To enter standby press and release key and touch 'activate standby' on screen. Hold to turn off.
3. **Day/Night –** changes preset lighting settings
4. **Screen lock/unlock**
5. **Manual Breath/Insp Hold –** Press & hold for Insp hold. Press once for mandatory manual breath
6. **O2 enrichment –** Adult/Paed – 100% O2 x2min, neonates 125% of last O2 setting for 2min.
7. **Print screen** – saves jpg of screen to USB
8. **Nebulizer on/off**. Stops after 30min. Stop manually by pressing button again
9. **Press and turn knob** – select & adjust settings
10. **Battery Status**



HamiltonT1 operator manual 8-4

On Screen Alarms

1. **Message Bar –** Will display alarm message
2. **Alarm Lamp –** Will flash Red for high priority, flash yellow for medium priority and show solid yellow for low priority alarm. All will be accompanied by an alarm message
3. **Alarm Silence key –** Will start a 2min silence. Press again to cancel alarm silence
4. **Alarm silence indicator and countdown**



HamiltonT1 operator manual 4-19

Alarm Settings

1. **Alarms –** Press to enter alarm adjustment menu
2. **Limits 1, 2, 3 –** scroll through for full set of changeable limits
3. **Red or yellow bar** (depending on alarm priority) indicates monitored value is out of range
4. **Current monitored value**
5. **Auto button –** Will set alarm range near current monitored values – disabled in neonatal mode

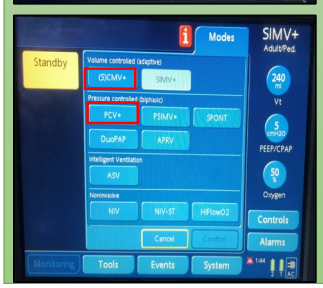
Please note – The maximum available inspiratory pressure is **10cmH20 below** the pressure limit set. To allow a PIP of 35cmH20 the pressure limit is set to 45cmH20

1. Start Screen

Choose neonatal or adult/ped setup. Neo <15Kg, Adult/ped >15Kg

Adjust weight (via height in adult/ped, via weight in neo)

Enter modes in top right corner to select desired mode of vent.



2. Mode Selection

Neonatal i.e. <15Kg – **PCV+**

Adult/ped i.e. >15Kg – (S)CMV+ or PCV+ or SPONT (equivalent to PS/CPAP)

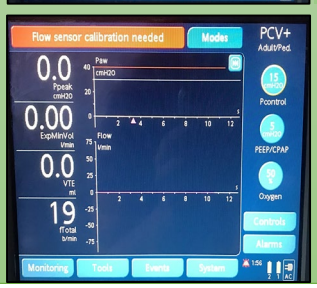
Enter 'controls' screen in bottom right corner to choose appropriate settings

3. Vent Settings

Choose appropriate settings based on mode selected

Pcontrol is set > PEEP ie Pcontrol of 15cmH20 + PEEP 5cmH20 = PIP 20cmH20

Choose 'more' for additional settings if required



4. Start Ventilation

Pressure/Flow screen as standard

Ensure Tidal Volumes are assessed & flow curves show absence of 'breath stacking'

Pink triangles denote pt triggered breaths

Enter 'alarms' options on bottom right and set appropriate alarm limits

Recommended modes of Paediatric Ventilation with Hamilton T1

- We find that the circuit deadspace in neonatal mode is too great to reliably deliver Volume targeted ventilation. We suggest that PCV+ is the standard mode for those <15Kg. This is analogous to Pressure Control and will fully support any patient triggered breaths.
- For >15Kg, either PCV+ or (S)CMV+ (Analogous to PRVC) are both effective modes and will support spontaneous breaths
- For invasively ventilated patients who have weaned to PS:CPAP – SPONT mode is a comfortable equivalent on the Hamilton

Paediatric Invasive Ventilation Guideline

(This is a guideline only and is not intended to replace patient-specific decision making by the senior Anaesthesiologist/Intensivist in attendance)

Common indications for intubation in the acute setting

It is often prudent to pre-emptively intubate a deteriorating child in advance of collapse – contact the PICU referral line for advice – 1800 222378

- **Airway protection/patency**
- **Respiratory Failure** – Progressive hypoxaemia/hypercarbia or respiratory muscle failure
- **Cardiovascular Support** - congenital heart disease/myocarditis (*discuss with PICU prior to intubation – can be ++Risk)* or impending cardiovascular collapse i.e. Severe Sepsis
- **Neuroprotection** – to facilitate scanning/optimise pC02 and reduce cerebral metabolic O2 demands
- **Facilitate a procedure** i.e. Central Venous Access / Chest drain insertion

Pre-Intubation Considerations

1. **Location –** Aim to move child as little as possible as this can cause significant delays - bring equipment/staff to the child where possible i.e. Resus/HDU bay
2. **Equipment Selection –** Use intubation/airway guide @ http://www.nasccrs.ie/IPATS/Guidelines/Respiratory/Intubation-and-Airway-guide-1- .pdf as an aide memoire if required
3. **Induction agents –** Ketamine 2mg/kg + Rocuronium 1mg/kg IV is a cardio-stable and reliable induction combination for most children. For older haemodynamically stable children, propofol + muscle relaxation is generally well tolerated. Atropine can be a useful adjunct in the ill neonate at risk of vagal stimulation and bradycardia.
4. **Pre intubation checklist / team huddle** – We recommend printing & using the 'pre intubation checklist' to ensure all monitoring/ equipment and team dynamics have been discussed prior to intubation. http://www.nasccrs.ie/IPATS/Guidelines/Respiratory/intube.pdf

Post Intubation Checklist

ETT Confirmation: Auscultation □ + ETC02 waveform Capnography □ + **CXR** □ **(Chest X Ray is mandatory before transfer). Naso/Oro gastric tube placement is required in all ventilated children – on free drainage for transfer**

Ongoing sedation: Young/unstable children – Morphine 20mcg/kg/hr (10-40mcg/kg/hr) + Midazolam 2mcg/kg/min (1-5mcg/kg/min). Older stable children can be sedated with Propofol infusion. We recommend intermittent muscle relaxation in all ventilated patients for transfer. Urinary catheterisation of all paralysed patients is recommended.

Blood Gas: Any blood source (cap/ven/art) is acceptable in paediatrics. Perform **at least one gas** on transport ventilator prior to departure - ideally after approx. 10min of stable ventilator settings. Correlate with ETC02 for ambulance journey.

Suggested *Starting* Ventilator Settings

Patient	Peak Pressures Start at lowest pressure to achieve chest rise	Tidal Vol	PEEP	Rate	I Time	I:E ratio	Target Sats
Infant	15-25	5-7ml/kg/min is a safe tidal volume target for most infants and children. Peak pressures should be weaned to target this volume to limit barotrauma whenever possible	5	35	0.5	1:2	>94%
Young child	15-30		5	25-30	0.7	1:2	>94%
Adolescent			5	15-20	1	1:2	>94%
+Asthma	To move chest		0-5	12-20	1	1:2-1:4	>90%
+ARDS	To move chest		5-15	15-20	1	1:1.5 -1:2	>88%

Troubleshooting Ventilation

D isplaced ETT	Ensure ETC02 reading, auscultate chest, check ETT depth at lips
O bstructed ETT	Suction ETT with largest possible catheter, **saline lavage can be very helpful** (1ml/kg up to 10ml per lavage)
P neumothorax	Check trachea is midline/look + auscultate, CXR if unsure / trans illuminate if neonate
E quipment	Check ventilator settings and circuit. Higher pressure may be required to ventilate children on T/port vents
S tomach	Ensure NG/OG is open and aspirate to ensure diaphragm splinting is not occurring

Deadspace – This can be difficult to manage in small infants on transport ventilators. If Pc02 is difficult to clear - ensure rate is optimised & breath stacking is not occurring; consider cutting ETT (leave 4cm); Ensure appropriate sized circuit is in use. Contact PICU 180022237 for further advice if these measures are ineffective. **Do NOT remove the HME filter or ETC02**