Paediatric Intensive Care Unit

Hamilton G5 Ventilator Set Up

Staff relevant to:	Medical and Nursing staff caring for children in the PICU
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Trust Ref:	C94/2016

1. Introduction and who this guideline applies to:

This guideline applies to all healthcare professionals involved with care of patients (from neonatal age up to 18 years) at paediatric intensive care unit (PICU). This document aims to familiarize the individual with the initial set up of the Hamilton G5 ventilator, from starting to the initial breath. This is only a guideline and although it does contain some suggestions it is not a replacement of knowledge of physiology and ventilation strategies.

Contents

2. Hamilton G5 set Up Checklist

1. FLOW SENSOR & CIRCUIT TYPE	
Neonatal < 10kg (1.3ml dead space) Neo / Paed circuit	
Paediatric > 7kg (9ml dead space) Neo / Paed circuit	
Adult > 25kg Adult circuit	
2. Attach circuit to ventilator, ensure water for the humidifier – add water when ready to ventilate	
3. Plug into mains and connect to gases, position in correct place	
4. Turn on the ventilator (switch is behind cover on the back)	
5. Select Patient type & input weight if required	
Neonatal < 7kg; can be used up to 10kg	
Paediatric > 7kg; input weight by adjusting height	
Adult > 25kg; Input weight by adjusting height	
6. Calibrate & Test the circuit	
7. Select mode of ventilation and input start values based on disease process and information from a hand bagging, anaesthetist or transport ventilator	
8. Input alarm limits (Vital with the Hamilton as will not ventilate properly if alarms triggered frequently)	
9. Start ventilation & monitor values	
10. Revisit alarm limits and adjust	

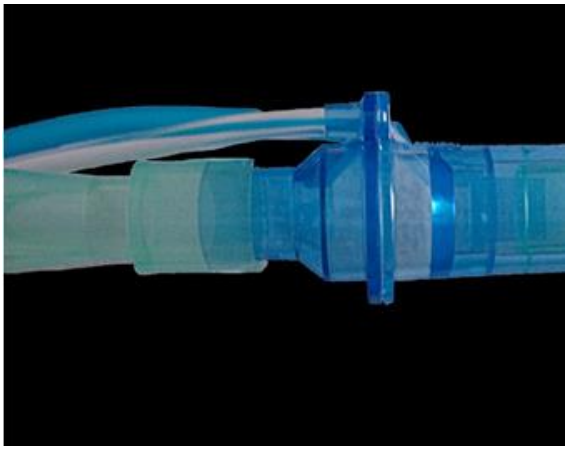
FLOW SENSOR TYPES

Neonatal flow sensor

- 1.3ml of dead space
- Weight < 10kg
- If > 7kg consider paediatric flow sensor
- ETCO2 will not fit
- No elbow should be used unless deemed necessary for safety, i.e. accidental extubation more likely
- Non-invasive modes deactivated

Paediatric flow sensor

- 9ml dead space
- Weight > 5kg but likely difficulties with CO2 retention
- Enables non-invasive ventilation
- Enables automatic modes and volume delivered modes
- Allows use of main stream ETCO2
- Allows dynamic lung graphics



Flow sensor attachment

Ensure the flow sensor is attached to ventilator correctly

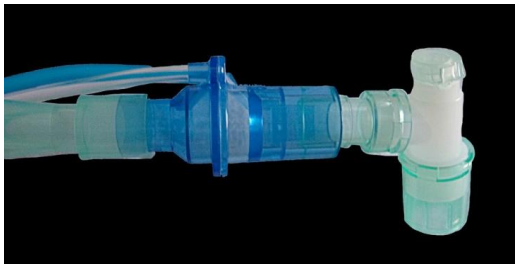
PATIENT TYPE SELECTION

NEONATAL MODE – weight does not need to be inputed

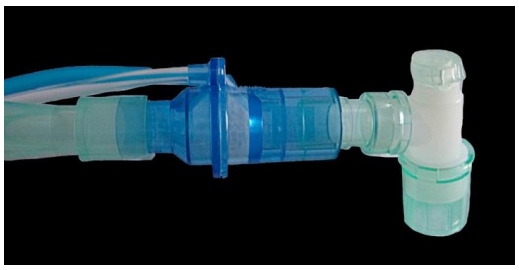
NEONATAL FLOW SENSOR

PAEDIATRIC MODE – input weight to nearest kg by adjusting the height

PAEDIATRIC / ADULT FLOW SENSOR



ADULT MODE – input weight to nearest kg by adjusting the height

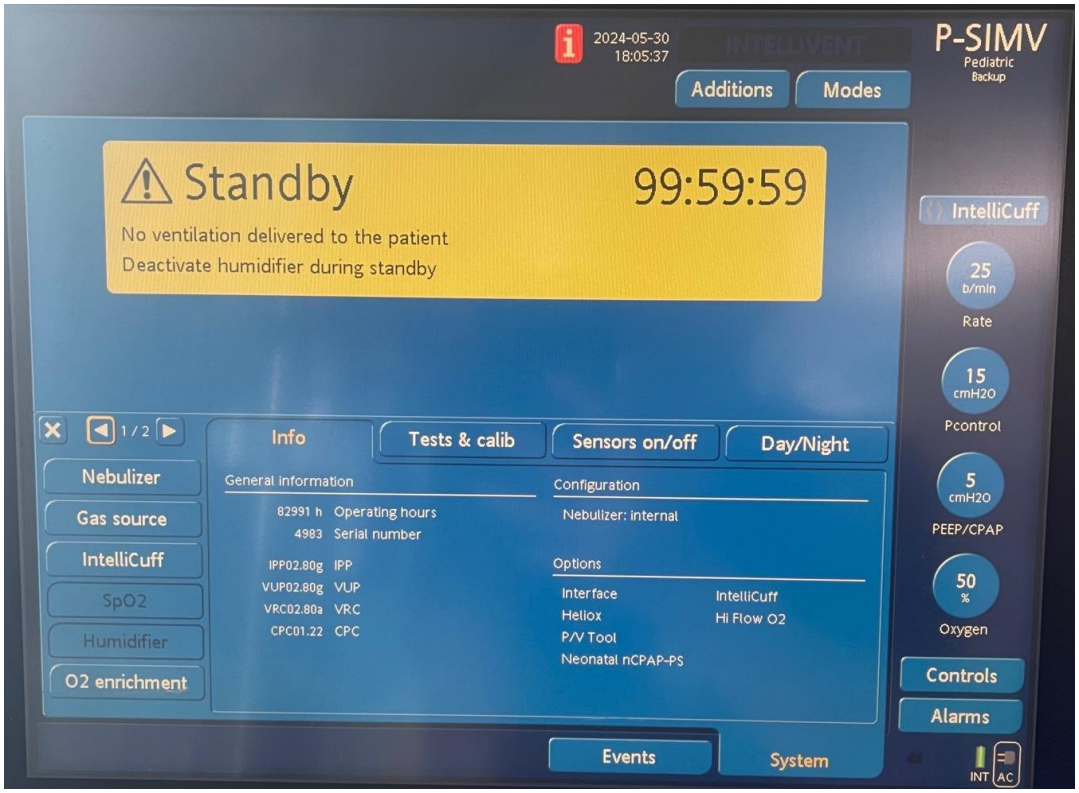


HELIOX SELECTION

Follow start up procedure as outlined

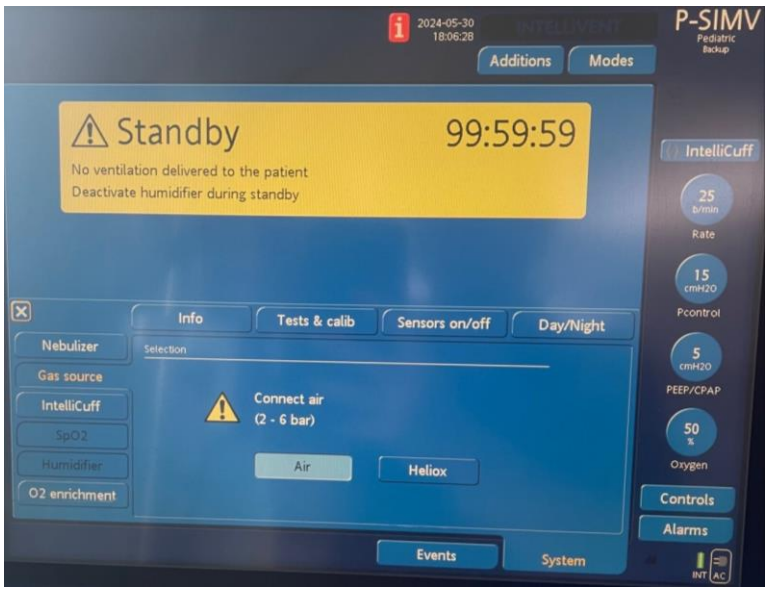
After all the calibrations return to STANDBY screen

Connect vent Heliox hose to Heliox changeover system



- Press the SYSTEM button
- Select GAS SOURCE from tab on LHS
- Select HELIOX

NB the extra button will allow you to see heliox but you will be unable to select unless ventilator is in standby.



CALIBRATE & TEST

Before use on a patient the flow sensor and the tightness of the circuit should be tested.
These can be found under system and then select Test & calibrate

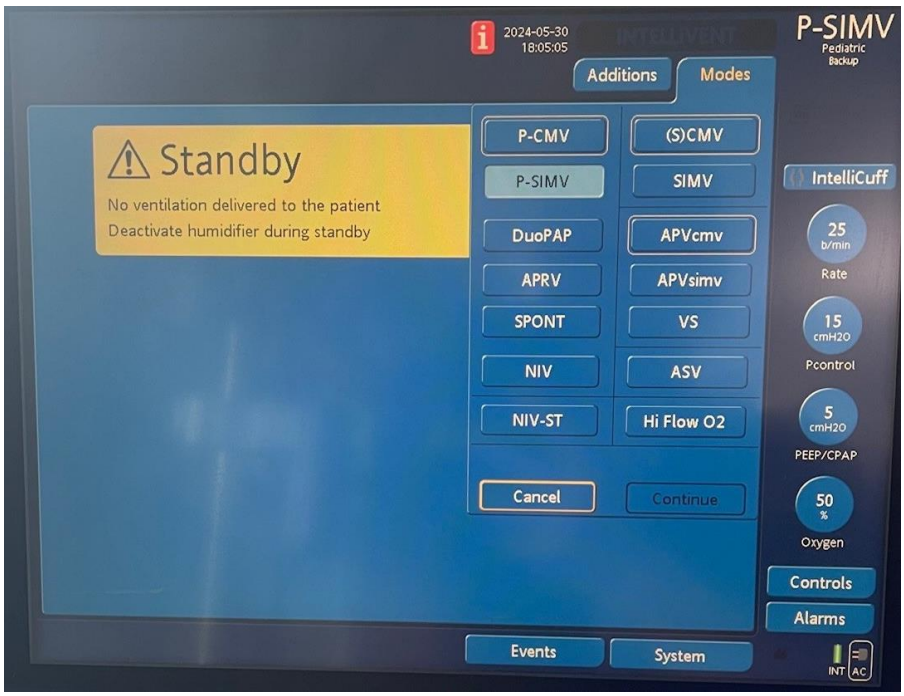
When calibrating the paediatric/adult flow sensor the flow sensor will need to be reversed. The timing of this is indicated in the left upper screen. There should be a frosted piece of tubing available to allow reversal.

During testing of circuit tightness the tubing will have to be blocked and then open to atmosphere and the blocked again. The timing is indicated in the left upper corner of the screen,

MODES OF VENTILATION

The modes of ventilation available are dependent on patient type. The slide shows those modes available to neonatal /paediatric patients. There are more modes available for paediatric and adults, however, these should be only used after discussion with the consultant. The table below shows the equivalent modes on the Servo i.

SERVO I	HAMILTON	DESCRIPTION /BENEFITS
PC/PS	**P-SIMV**	Standard starting mode. Pressure regulated and delivered mode. A mandatory pressure is set. Peak Inspiratory Pressure (PIP) = Pcontrol + PEEP
PRVC	**APVcmv / APV simv**	Set Volume, however delivered as a pressure wave. This allows a fixed minute ventilation, i.e. more stable CO_2 elimination but still has the advantages of oxygenation provided by pressure ventilation. Practically useful if CO_2 needs to be tightly controlled (i.e. Head Injury) or if lung compliance changes occur rapidly (i.e. Surfactant use) **NB SEE ALARM LIMITS**
BiVent	**DuoPAP**	Pressure ventilation designed to support spontaneous breathing on two alternating levels of CPAP. Can be used to mimic others forms of pressure ventilation, however is fully synchronised and allows spontaneous breathing at any time of the ventilation cycle and thus can be more comfortable
PS/CPAP	**SPONT**	Requires the patient to initiate all breaths. Useful to assess respiratory drive prior to extubation



ALARM LIMITS

Ensure the alarm limits are appropriately set before you place the patient on the device preventing possible patient injury.
Although you can set all alarms rapidly using the Auto alarm function, some settings are not appropriate under all clinical conditions.

P-SIMV

Pressure cmH_2O should be set 10cmH_2O

above maximum predicted pressure (cmH_2O).

Maximum 40 cmH2O unless discussed with Consultant and documented in notes

Vt (tidal volume) Max = 15 x Weight
Min = 4x Weight
ExpMinVol (l/min) = Vt x rate

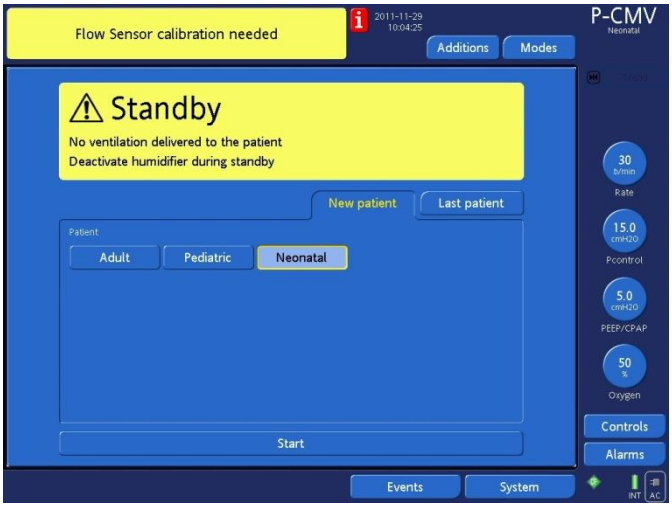
APVsimv / APVcmv

Pressure cmH2O needs to be set 10cmH2O above predicted maximum PIP (see below).

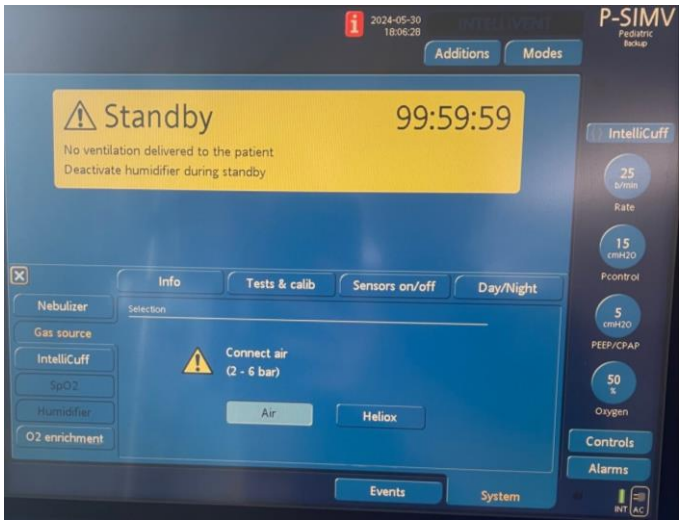
The maximum available inspiratory pressure for INTELLiVENT-ASV, ASV, APVcmv and APVsimv is 10 cmH_2O below the high pressure limit, indicated by a blue colored band on the pressure waveform display. Set the high pressure limit to a safe value (example, 45 cmH_2O, this limits the pressure target to a maximum of 35 cmH_2O). When the high pressure alarm is set too low, it can lack enough margin for the device to adjust its inspiratory pressure to deliver the target tidal volume.

STOPPING HELIOX

The ventilator needs to be placed in standby, so hand bag the patient.



NB Turn Heliox changeover system to 'NO FLOW' and disconnect vent hose from Schrader port. Removing the Heliox cable does not require any screw drivers or spanners. If you think it needs these STOP as you can cause damage to the ventilator.



Press the SYSTEM button
Select Gas SOURCE
The following screen will be shown
Press the AIR button
Note the Heliox symbol shown in the top right of screen will disappear
Restart the ventilator, the setting should not have changed

3. Education and Training

Training and raising awareness are on-going processes. On-going awareness is promoted through the induction and continuous bedside teaching. Training is provided for medical staff during lunchtime teaching (Wednesdays) and other sessions, and at junior doctors' induction training. Nursing education is supported by the Practice Development teams, and nursing educators.

4. Monitoring Compliance

Nil identified at present but will be reviewed once guideline has been put in place and active.

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Number of incident forms relating to setting up ventilator	3 yearly assessment of incident forms related to the Hamilton	James Whitelaw	3 yearly	PICU clinical practice group

5. Supporting References

The Hamilton G5 handbook

6. Key Words

Ventilator set up, Heliox, flow sensor, ventilation mode

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.
As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) James Whitelaw - Consultant	**Executive Lead** **Chief nurse**
Details of Changes made during review: Minor Changes: Page 1 : 1. Introduction expanded to include 'This guideline applies to all healthcare professionals involved with care of patients (from neonatal age up to 18 years) at paediatric intensive care unit (PICU)' Page 2 : 2. Checklist reformatted Page 3: Flow Sensor sizes : 'sizes' changed to Types Neonatal Flow Sensor : 'Pressure delivered modes only removed Paediatric Flow Sensor : Photo added Page 4 : Patient Type Selection – reformatted and 'Paediatric/Adult Flow sensor' removed from Adult section Page 5: Heliox Selection – Selecting patient type and associated images removed Page 9 : Stopping Heliox – 'You can now remove the Heliox cable and cylinders' removed 3. Education and Training updated : 'Training and raising awareness are on-going processes. On-going awareness is promoted through the induction and continuous bedside teaching. Training is provided for medical staff during lunchtime teaching (Wednesdays) and other sessions, and at junior doctors' induction training. Nursing education is supported by the Practice Development teams, and nursing educators'.	