

Newborn Services Clinical Guideline

Note: The electronic version of this guideline is the version currently in use.

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The [general disclaimer](#) regarding use of Newborn Services Guidelines and Protocols applies to this guideline.

Conventional Ventilation Modes

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December

2001

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What is the difference between ventilation modes?

There are essentially three types of respiratory support provided in NICU.

[CPAP](#) (continuous positive airway pressure) is our first line mode of support for infants with respiratory distress from any cause. The use of early CPAP is effective in reducing the need for ventilation and surfactant in preterm infants with respiratory distress syndrome, as well as being an effective mode of ventilation for transient tachypnoea of the newborn and meconium aspiration syndrome in term and near term infants. An added advantage is that it is also an effective treatment for apnoea.

Other types of assisted ventilation include **positive pressure ventilation** ("conventional" ventilation) and **high frequency oscillation ventilation (HFOV)**. The specialist on duty will almost always initiate HFOV after assessment of an infant with severe respiratory failure. A [guideline](#) is available which gives some basic information on how to ventilate infants in this mode.

Conventional ventilation is however now more complex because there are many different ventilator modes. Many of them have different names for the same sort of process. Our first-line ventilator is the Drager Babylog 8000*plus*, which is both a conventional ventilator but is also able to oscillate smaller infants. We also use VIP-Bird ventilators as a second line.

We have a SensorMedics 3100 High Frequency Oscillatory Ventilator which is generally reserved for infants who have respiratory failure despite increasing "conventional" support. This ventilator is not able to provide conventional ventilation.

The terminology for ventilation modes is confusing and it is fundamental to understand the differences between them in order to use the best mode for the baby. It also helps to have a basic understanding of respiratory function monitoring.

In all scenarios below, the ventilator is assumed to have a set up with:

Ventilator rate	60bpm
Inspiratory time (T _i)	0.35 seconds
Expiratory time (T _e)	0.65 seconds
Peak Inspiratory Pressure (PIP)	15 cmH ₂ O
Positive End Expiratory Pressure (PEEP)	5 cmH ₂ O

These are the default settings on SIMV for all babies ventilated on admission to the NICU. Different settings may be ordered according to the amount of support the baby needs.

The default terminology is that of the Babylog. If the same mode is available on the VIP-Bird with a different name, this is noted.

Mode	Explanation
IPPV (Intermittent Positive Pressure Ventilation)	60 breaths, one second apart are given by the ventilator, irrespective of the baby's own breathing. A PIP of 15 is applied, with a PEEP of 5. The T _i is 0.35 seconds.
SIMV (Synchronised Intermittent Mandatory Ventilation)	This is the preferred default mode in NICU. 60 ventilator breaths are delivered - synchronised with the baby's breath. If the baby is breathing faster than 60 bpm, only 60 ventilator breaths are delivered and any additional breaths are not assisted. The T _i is 0.35 seconds. If the baby is not breathing, breaths will usually be delivered 1 second apart. If the baby takes less than 60 breaths per minute, the ventilator will synchronise all the breaths, plus deliver some untriggered breaths.
SIPPV	Every breath is assisted, but the baby receives a minimum of 60 bpm. If the baby breathes at 100 bpm, then the

<p>(Synchronised Intermittent Positive Pressure Ventilation)</p> <p>(Assist Control, AC, on the VIP-Bird)</p>	<p>baby receives 100 assisted breaths. The PIP is 15, the PEEP is 5, and the T_i is 0.35 seconds.</p> <p>(Note: on the VIP-Bird, applying termination sensitivity (see below) in this mode limits the T_i – see Pressure Support Ventilation, PSV).</p> <p>Note: it is important that the T_i is watched carefully in this mode – too long a set T_i in an infant with tachypnoea will result in a short expiratory time (T_e) and will result in air trapping, with the risk of air leak. PSV (see below) is a safer mode.</p>
<p>PSV</p> <p>(Pressure Support Ventilation)</p>	<p>Like SIPPV, all breaths are assisted with a default minimum rate of 60. A PIP of 15 is still delivered, the PEEP is still 5, but the T_i is limited according to the baby's own lung inflation (i.e. as the lungs fill up, the breath is terminated). This means that the baby is controlling the duration of breaths according to the lung mechanics. It is a safer mode than SIPPV in that air trapping and a resultant leak are unlikely.</p> <p>In the VIP-Bird, this mode is achieved by setting the "termination sensitivity". This is set as a percentage of the peak inspiratory flow rate - as the lungs reach full inflation, flow rate decreases. The default is to set it to 10% of the peak flow rate. This does not work well on the VIP-Bird if there is a large leak.</p>
<p>VG</p> <p>(Volume Guarantee)</p>	<p>This mode is available only on the Babylog. In this mode, the ventilator is asked to deliver a certain expired tidal volume (V_T) – usually 4-8ml/kg breath. The ventilator will look at the previous breath and deliver the appropriate amount of PIP to deliver this volume. A maximum PIP is set – if the ventilator cannot deliver the appropriate V_T, the ventilator will alarm. This mode does not work if there is a big leak as the expired V_T will be under-reading.</p> <p>It is important to set up the ventilator appropriately. See the associated webpage on Volume Guarantee.</p> <p>This mode is best delivered with PSV or with SIPPV. This mode can create a lot of alarm messages so patient choice and appropriate settings are important (see troubleshooting).</p>

Topic	Description
<p>CPAP</p>	<p>1. A description of the use of CPAP in NWH NICU. Currently contains a slideshow presentation available only through the intranet site.</p>

Ventilation Basics	1. A "Dummies Guide" about how to change ventilator settings.
Modes of Conventional Ventilation	1. A brief description of terminology for the different available modes.
Respiratory Function Monitoring and Graphical Analysis	1. An explanation of the information available from respiratory function monitors. Some examples are included.
Setting up Volume Guarantee	1. A guide to picking the correct baby, starting on the correct settings, and changing the settings appropriately.
Alarms and the Babylog	1. A guide to dealing with alarm messages.
High Frequency Oscillation Ventilation	1. A guide on initial settings for HFOV, with links to related documents.
How should I set up HFOV on the Babylog?	1. A guide to the use and limitations of HFOV the Babylog 8000 <i>plus</i> .
Nitric Oxide	1. Links to the clinical guideline for iNO.

File original from : <http://www.adhb.govt.nz/newborn/teachingresources/ventilation/ConventionalVentilationModes.htm>

RENDER TEAM

VERSION: ENG-ANES-20111011-2

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