# INVASIVE RESPIRATORY SUPPORT

| | Current Weight | < 700 g | ≥ 700 g - ≤ 1.5 kg | > 1.5 kg |
|---|---|---|---|---|
| Set-Up | **Ventilation Mode** | SIPPV + VG | SIPPV + VG | SIMV + VG |
| | **Starting Tidal Volume** | 6 ml/kg | 5 ml/kg | 4.5 ml/kg |
| | **Inspiratory Pressure Limit (Pmax)** | 25 $cmH_2O$ | 28 $cmH_2O$ | 30 $cmH_2O$ |
| | **PEEP** | 5 $cmH_2O$ | 5 $cmH_2O$ | 5 $cmH_2O$ |
| | **Inspiratory Time** | 0.3 – 0.35 s | 0.35 s | 0.4 s |
| | **Respiratory Rate** | 45 – 60 bpm (except HIE) | | |
| | **In-/Expiratory Flow** | 8 l/min | | |
| | **Trigger setting** | Set to flow trigger with max sensitivity | | |
| Aim | $FiO_2 \leq 0.4$ and blood gas with pH 7.30 - 7.35, $PaO_2$ 6.5 - 9.5 kPa, $PaCO_2$ 6.5 - 8.5<br>**Avoid** pH > 7.45 and $PaCO_2$ < 4.5 kPa or pH < 7.2 and $PaCO_2$ > 10 kPa (e.g. in severe BPD) | | | |
| If ETT leak persistently > 50%, VG is ineffective, then consider upsizing the ETT before proceeding to adjust the ventilation further | | | | |
| Once on Ventilation | **Target Tidal Volume** | 5 – 8 ml/kg | 4.5 – 7 ml/kg | 4.5 – 6 ml/kg |
| | | Adjust in steps of 0.5 - 1 ml/kg | | |
| | | Up to 12 ml/kg might be needed in severe BPD | | |
| | **Inspiratory Pressure Limit** | Set least 5 cm $H_2O$ above the working inspiratory pressure | | |
| | If PIP consistently > 30 $cmH_2O$ on max TV in the absence of ETT leak > 50%, troubleshoot (see below) and consider alternative ventilation strategies considering whether this a predominant restrictive, obstructive or mixed lung disease, e.g. HFOV<br>If $FiO_2$ requirement rising, but $CO_2$ removal within target range, consider increasing PEEP | | | |
| Weaning and Extubation | **Min Tidal Volume** | 5 ml/kg | 4.5 ml/kg | 4.5 ml/kg |
| | | Can be higher depending on underlying pathology | | |
| | **Min Inspiratory Pressure Limit** | Positive inspiratory pressure auto-weans on VG. Ensure mean airway pressure needed is consistently ≤ 8 $cmH_2O$ (< 10 $cmH_2O$ with some pathologies) | | |
| | **Respiratory Rate** | Wean back-up rate to no less than 25 – 35 BPM and ensure baby is triggering breaths and breathing above the set rate (during SIPPV breath rate is controlled by the baby, so no need to wean rate unless the rate is > 50) | | |
| | Extubate, if good respiratory drive present and off (or almost off) sedation, on minimum ventilator settings for the size and disease of the baby and $FiO_2 \leq 0.4$ with good gases (except BPD infants) | | | |


Department of Neonatology, BSUH, 2020

| Problem | Troubleshooting | What to do |
|---|---|---|
| **Low Tidal Volume Alarm**<br><br>**OR**<br><br>**Working Pressure constantly very close to Pmax (PIP Limit)**<br><br>**OR**<br><br>**Low Minute Volume Alarm** | **Endotracheal tube** | • Check infant's chest movement and air entry<br>• Rule out ETT displacement, obstruction, chest splinting pneumothorax, large ETT leak (> 50 %), water in circuit and ventilator dysfunction<br>• Check PIP limit<br>• If "resistance" displayed on the ventilator higher than baseline obstruction likely (look at the trend rather than an absolute value) |
| | **Is there any leak/disconnection in the ventilator circuit? Is there water in the ventilator circuit?** | • Fix any leak/disconnection in circuit<br>• Empty water from ventilator circuit |
| | **Is there a persistent significant endotracheal tube (ETT) leak of > 50% ?** | • Adjust position and ties of ETT<br>• Upsize ETT if possible and gases sub-optimal, needing higher pressures and high $O_2$ requirements.<br>• Hold if planning to extubate and gases normal, ventilation acceptable and no alarms<br>• Change to pressure ventilation if constantly alarming and you plan to extubate soon<br>• Check expiratory membrane is dry and ensure flow sensor wire exits vertically |
| | **Is your PIP limit very close to the working pressure?** | • Ensure enough room (at least 5 $cmH_2O$) between your working pressure and the PIP limit.<br>• Consider increasing the Pmax once ETT obstruction, ETT leak and ventilator issues ruled out |
| | **Can the high PIP requirements or inability to achieve set TV be explained by the lung disease?** | • Address the underlying condition<br>• Consider repeat surfactant |
| | **Is the infant splinting the chest?** | • Consider increasing the Pmax<br>• Consider increasing the tidal volume |
| **Infant not Synchronous with the Ventilator** | **Is your set VT high enough to support the infant's spontaneous breathing?** | • Increase set VT until the respiratory pattern is less laboured and blood gases normalized<br>• Extubate, if appropriate |
| | Infants with set VT lower than the spontaneous VT display, will make vigorous spontaneous efforts, gasp, have laboured breathing and an elevated $PaCO_2$ just to get an adequate size breath | |
| **High Minute Volume Alarm**<br><br>**OR**<br><br>**Auto-Triggering** | **Lung compliance improved?** (If set VT is too low, you are not providing adequate alveolar volume and the infant has to breathe very quickly)<br>**Is your infant's respiratory rate abnormally high, especially on SIPPV?** | • Consider increasing VT<br>• Exclude ETT leaks, ETT secretions, air leaks and water in the ventilator circuit or expiratory membrane<br>• Baby ready for extubation?<br>• If the respiratory rate is abnormally high, consider increasing trigger settings after ruling out other causes |