POINT
Peri-Operative Insufflatory Nasal Therapy
by Armstrong Medical

Clinical Summary

Helping prevent peri-operative pulmonary complications
Hypoxia; a peri-operative risk

Pulmonary complications significantly contribute to peri-operative morbidity, mortality and increased hospital stay. (3)

Pre-op

Securing an artificial airway remains a hazardous procedure during the induction of anaesthesia.

There is a positive correlation between obesity and difficult intubation, while critically ill patients can desaturate in as little as 30 seconds. (1)

Pre-oxygenation is delivered to prolong the apneic window, during which nitrogen is washed out of the lungs and alveoli are filled with oxygen.

Studies suggest 3 minutes pre-oxygenation with 100% oxygen can result in absorption atelectasis of up to 5% lung volume. (2)
Patients with respiratory disease have an increased chance of developing complications peri-operatively.

For certain patients, regional anaesthesia supplemented by sedation is chosen to avoid the pulmonary complications of general anaesthesia (3).

Sedation does have risks, notably respiratory depression (4). All sedatives and opioids have the potential to depress central hypercapnic and/or peripheral hypoxemic drives (5).

Bronchoscopy is one of the most common procedures performed under sedation. In addition to the effects of sedation, the bronchoscope also takes up to 10–15% of the tracheal lumen, resulting in increased work of breathing and decreased PaO$_2$ (6).

Post-operative pulmonary complications (PPC) are linked to increased length of stay and mortality.

Post-operative atelectasis occurs in 90% of patients and accounts for as much as 20% lung volume (2). Anaesthesia and surgery compromise optimal secretion clearance. The ability to generate expiratory forces is hindered in the post-op patient by reduced tidal volume caused by atelectasis or pain.

Obese patients are further susceptible to PPC as they consume approximately 25% more oxygen than non-obese subjects, lung compliance is decreased by approximately 25% and FRC reduced by approximately one third (7).

Cardiac, Thoracic and Abdominal surgery present the highest risk of PPC (8).

<table>
<thead>
<tr>
<th>HIGHEST RISK OF PPC</th>
<th>Cardiac 39.6%</th>
<th>Thoracic 31.4% (8)</th>
<th>Abdominal 7.2%</th>
</tr>
</thead>
</table>
What’s the POINT?

Pulmonary complications may present at any stage of the patient’s peri-operative experience. Appropriate interventions can minimise these risks in the pre, intra and post-operative periods \(^{(9)}\).

POINT delivers humidified high flow therapy to support your patient during the peri-operative period.

**POINT Features**

- Adjustable flow rates
- Integrated O\(_2\) analysers
- AquaNASE® high flow cannula
- Ultra-PEP therapy
- AquaVENT® Humidification
- Adjustable FiO\(_2\)
Why choose POINT?

READY TO USE
- POINT system does not require decontamination between patients
- POINT starter Flowkit protected by BioCote®, for rapid set up when required
- Rapid heat humidification chamber, achieves optimal temperature quicker
- Portable for use during transport

IMPROVED CONTROL
- Accurate FiO₂, higher flow rates reduce dilution from room air
- Adjustable FiO₂, reducing concerns over O₂ toxicity or absorption atelectasis
- Adjustable flow rates for nasal cannula (60L/min) and face mask CPAP (>60L/min)
- Humidification improves patient comfort and secretion clearance
- Ultra-PEP aids improved FRC and secretion clearance

Pre-op
- Increased and accurate pre-oxygenation
- Increased apneic window for management of difficult airways

Intra-op
- Apneic oxygenation during ENT surgery
- Respiratory support during procedural sedation

Post-op
- Reversal of anaesthesia induced atelectasis
- Improved secretion clearance
Studies have demonstrated variable PEEP is achieved (2-7cmH₂O) with Nasal High Flow (NHF) (13). For some patients, variable PEEP may not be adequate and continuous pressure is required. Continuous and measured PEEP may be achieved using a combination of NHF and Ultra-PEP or mask CPAP.

Mask CPAP treats or prevents atelectasis by delivering a flow rate equal to the patient’s Peak Inspiratory Requirement (PIR), maintaining the desired pressure throughout the respiratory cycle.
High flow oxygen therapy delivered via nasal prongs can reduce the patient's dead space by up to one third in adults. This decreases rebreathing of CO₂ and improves alveolar ventilation for patients in which tidal volume has decreased (10).

<table>
<thead>
<tr>
<th>Nasopharyngeal dead space washout</th>
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<tbody>
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<td><strong>Nasopharyngeal dead space washout</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Alveolar ventilation in healthy patients</th>
<th>Deadspace</th>
<th>Tv</th>
<th>RR</th>
<th>Mv</th>
<th>Av</th>
</tr>
</thead>
<tbody>
<tr>
<td>150ml</td>
<td>500ml</td>
<td>12</td>
<td>6000ml</td>
<td>4200ml</td>
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</table>

<table>
<thead>
<tr>
<th>Alveolar ventilation in respiratory distress</th>
<th>Deadspace</th>
<th>Tv</th>
<th>RR</th>
<th>Mv</th>
<th>Av</th>
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</thead>
<tbody>
<tr>
<td>150ml</td>
<td>150ml</td>
<td>40</td>
<td>6000ml</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Alveolar ventilation in nasal high flow</th>
<th>Deadspace</th>
<th>Tv</th>
<th>RR</th>
<th>Mv</th>
<th>Av</th>
</tr>
</thead>
<tbody>
<tr>
<td>100ml</td>
<td>150ml</td>
<td>40</td>
<td>6000ml</td>
<td>2000ml</td>
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</tr>
</tbody>
</table>

**Accurate FiO₂**

Flow rates closer to the patient’s PIR reduce entrainment of room air and the subsequent dilution of FiO₂ (14).

The POINT system allows adjustment of FiO₂ to address concerns of absorption atelectasis associated with higher oxygen concentrations.

**Maintained mucociliary function**

Heated and humidified oxygen therapy ensures patient comfort and compliance to achieve the physiological benefits at higher flow rates.

Post-operatively, humidification plays a crucial role in maintaining effective secretion clearance, preventing mucous plugging, atelectasis, infection and subsequent complications.
PEEP versus CPAP; what’s the difference?

PEEP & CPAP are often mistaken as one and the same therapy. Defining the difference helps us understand the benefits and limitations of each therapy.

- PAP is any pressure applied to the airways above atmospheric pressure.
- PEEP refers to the positive airway pressure at the end of expiration only. During inspiration the pressure will drop below the PEEP level.
- CPAP refers to the PEEP pressure being maintained during the entire respiratory cycle (inspiration and expiration).
- To prevent a drop of pressure during the respiratory cycle the flow rate must exceed the patient’s peak inspiratory flow rate. In respiratory distress PIR may range from 60-120L/min.
Causes of atelectasis

Atelectasis is present in 90% of patients post-op and is associated with increased rates of post-operative pulmonary complications. Atelectasis promotes bacterial growth in the lung (15), increasing the risk of post-operative pneumonia.

Compression of lung tissue - There is a correlation between body mass index (BMI) and atelectasis, with morbid obesity accompanied by an increased amount of atelectasis.

Patient position - The resting lung volume (functional residual capacity, FRC) is reduced by 0.7-0.8L by changing the body position from upright to supine with a further decrease by 0.4-0.5L with the induction of general anaesthesia.

Absorption atelectasis behind closed airways - A drop in FRC promotes closure of airways. Gas will be absorbed in alveoli behind the closed or intermittently closed airways, eventually leading to collapse.

Reduction in alveolar surfactant due to the lack of intermittent deep breaths during mechanical ventilation. Decreased surfactant results in reduced alveolar stability and may contribute to airway closure (3).

Mucous plugging - Anaesthesia may adversely affect the lungs’ defence mechanisms, impairing the ability to cough and suppressing mucociliary clearance, leading to post-operative mucous plugging.

Post-operative therapies

Studies have demonstrated variable PEEP (2-7cmH\textsubscript{2}O) can be achieved with Nasal High Flow (13). Variable factors include flow rate, size of prongs in relation to the nares and mouth or nose breathing. The PEEP is pressure due to the resistance generated by the continuous administration of high flow of gas (60L/min).

For some patients variable PEEP provided by NHF may not be adequate and high flow CPAP with a face mask is required.

COUSSA M et al (16) observed in morbidly obese patients that 10cmH\textsubscript{2}O of CPAP during the induction of anaesthesia decreased the amount of atelectasis.

A study of 200 patients by SQUADRONE V et al demonstrated CPAP reduced post-op rates of intubation, ICU length of stay and pneumonia rates (15).

Armstrong Medical’s POINT and FD140 systems provide quick and simple escalation from NHF (PEEP) to full mask CPAP.
POINT Range

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Box Qty</th>
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<tbody>
<tr>
<td>AMHO1509/030</td>
<td>Heated Humidified Oxygen System complete with AquaNASE® Nasal Cannula and bacterial viral breathing filter</td>
<td>10</td>
</tr>
<tr>
<td>AMHO1509/008</td>
<td>AquaVENT® Heated Humidified Oxygen System complete with AquaNASE® Nasal Cannula</td>
<td>10</td>
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<tr>
<td>AMPT1001/002</td>
<td>Ultra-PEP Exerciser with manometer</td>
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<tr>
<td>AMCPUK01258</td>
<td>CPAP adaptor kit</td>
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<tr>
<td>AMNS1004</td>
<td>AquaNASE® Nasal High Flow System (4mm)</td>
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<tr>
<td>AMNS1005</td>
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<tr>
<td>AMNS1006</td>
<td>AquaNASE® Nasal High Flow System (6mm)</td>
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</tr>
</tbody>
</table>

*Optional pressure measurement

120L/min flow

Integral digital oxygen display

AquaVENT® heater humidifier

Both MaxVenturi™ 120 and FD140 are supplied with AquaVENT® heater humidifier

MaxVenturi™ 120

FD140

*Pressure respiratory rate and apnoea alarms

Max flow rate CPAP 140L/min, NHF 60L/min

60 min internal battery life

*For transition from NHF to CPAP, adequate flow rates and pressure measurement are essential.

Codes

Ordering Information

*Pressure respiratory rate and apnoea alarms

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References

Armstrong manufacture a complete range of disposable respiratory products for anaesthesia and critical care applications. For supply of these products or any product within the Armstrong range, please contact your local representative.