HEATED HUMIDIFIED NASAL CANULAE – USE OF VAPOTHERM FOR RESPIRATORY SUPPORT - CLINICAL GUIDELINE V1.0
SUITABLE FOR BABIES WITH:
Respiratory Distress Syndrome RDS, Chronic Lung Disease CLD, Meconium Aspiration Syndrome MAS, Pulmonary oedema, Pneumonia, transient tachypnoea of the newborn TTN, babies intolerant of nCPAP/nasal trauma from CPAP, mild apnoea of prematurity

NOT SUITABLE FOR:
- Severe respiratory distress
- Rising oxygen requirement >40% with worsening acidosis, rising CO2 (discuss with senior, consider intubation +/- surfactant/MIST)
- Babies with severe cardiovascular instability
- Frequent apnoeas (despite caffeine for <34 weeks gestation)

SET UP:
Set up machine with a low flow capsule
Maximum flow 8L, prime tubing and set temperature
Operating temperature 34 - 35°C for flow <5L
Operating temperature 36 - 37°C for flow ≥ 5L

- Use cannulae no larger than ½ diameter of the babies nares
  Guide:
  <1kg Premature size
  1-2 kg Neonatal size
  >2kg Infant size

STARTING HFNC
- Start at 5-7L flow
- Use up to 8L flow for infants over 1kg
- If FiO2 >.60, C02 retention >8, pH <7.26 or regular apnoeas discuss urgently with Senior
- Monitor work of breathing and blood gases as clinically indicated until stable

WEANING HFNC
- Attempt to wean 1L/min 24 hourly if FiO2 .21 – 0.4 if >1.5kg
- Attempt to reduce by 0.5L/min 24 hourly if <1.5kg
- Wean slowly by 0.5L/min alternate days if FiO2 > 0.3
- Attempt to stop if in air once flow is 2.5L/min
- Wean to low flow 02 if oxygen still required

ANY sudden increase in 02 requirement, increased work of breathing, clinical instability consider Displacement or Obstruction of prongs, Pneumothorax or Equipment failure
- All babies on HFNC should have blood gas monitoring after any reduction or increase in flow. Any baby in FiO2 over 0.4 should have blood gases checked at least 4 hourly unless chronic dependence/ guided by Consultant
1. **Aim/Purpose of this Guideline**

   This guideline refers to the use of a heated humidified circuit to provide respiratory support with blended oxygen and air via nasal canulae in neonates at flow rates >1L/min.

2. **The Guidance**

   **Background:**

   This guideline refers to the use of a heated humidified circuit to provide respiratory support with blended oxygen and air via nasal canulae in neonates at flow rates >1L/min. The use of high flow nasal canulae as a means of providing non-invasive respiratory support to preterm and term neonates is now widespread. There is little published evidence to support various strategies used to decide on flow rates and weaning of high flow support (Cochrane reports). This guideline is based on consensus and experience to standardise and support decision making on the neonatal unit and is consistent with Derriford NNU guideline.

   **Mechanism of action:**

   - Thought to be varied but proposed mechanisms are:
   - Washout of NP dead space = better alveolar ventilation
   - Reduction in inspiratory resistance arising from naso-pharynx
   - Improvement in conductance and pulmonary compliance due to adequate supply of warm, humidified air
   - Reduction in metabolic rate associated with gas conditioning
   - May provide positive distending pressure for lung recruitment

   **Indications for use:**

   - Treating or preventing apnoea of prematurity
   - Respiratory support for infants with Respiratory Distress (first-line or post extubation), chronic lung disease, meconium aspiration, pulmonary oedema, pulmonary hypoplasia and pneumonia
   - As an alternative to CPAP
   - Infants slow to wean off nasal CPAP
   - Infants with nasal trauma from nasal CPAP

   **Contraindications for use:**

   - Upper airway abnormalities precluding correct placement of prongs.
   - Ventilatory failure
   - Severe cardiovascular instability
   - Frequent apnoeas (despite caffeine in preterms)

   **Settings:**

   1. Set up Vapotherm with low flow cartridge as per manufactures manual.
   2. Set operating temperature:
      - flow rate < 5 l/min = 34 – 35C
3. Select correct size nasal prongs, use following table as a guide but nostril size will vary and prongs should not occupy >50% of nares. Also consider impact of NG tube or cleft palate.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Cannula type</th>
<th>Outer diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1.4 Kg</td>
<td>Premature</td>
<td>0.14cm</td>
</tr>
<tr>
<td>1.4 – 2.6 Kg</td>
<td>Neonatal</td>
<td>0.19cm</td>
</tr>
<tr>
<td>&gt; 2.6 Kg</td>
<td>Infant</td>
<td>0.27cm</td>
</tr>
</tbody>
</table>

4. Select initial flow rate:
   - **Start at a flow rate of 4 – 6 L/min**
     - Flow rates > 6 L/min in infants < 1 Kg should be discussed with consultant.
     - Use up to 8 L/min in infants >1 Kg,
       - **but if the baby is requiring FiO2 > 0.4 or has CO2 retention, acidosis or apnoea, the infant needs review for alternative respiratory support.**

**Monitoring:**

Whilst receiving Vapotherm support all babies should have continuous monitoring of heart rate, respiratory rate and oxygen saturations. Blood gas analysis should be performed after initiation of treatment, after a change in settings and/or if clinically indicated.

Any significant instability or sudden increase in FiO2 the baby should be reviewed with careful consideration of potential of pneumothorax. Placement of prongs should be regularly checked.

**Weaning:**

FiO2 should be weaned as soon as possible to attain target saturations appropriate for gestation (see Oxygen therapy guideline). This is a guide only:

- **Babies >/=1.5kg** – attempt to wean 0.5L/min 12 hourly if FiO2 0.21-0.3
- **Babies <1.5Kg** – attempt to wean 0.5L/min 24 hourly if FiO2 0.21-0.3
- Flow can be weaned more slowly if FiO2 >0.3 – 0.5L every 48 hours
- Stop Vapotherm if in air and requiring 2.5L/min or less or consider switch to low flow if in oxygen and requiring ≤2L/min flow.
References:


Carlo Dani MD, Simone Pratesi MD, Claudio Migliori MD, Giovanna Bertini MD.

Heated humidified high-flow nasal cannula: use and a neonatal early extubation protocol

High flow nasal cannula versus nasal CPAP for neonatal respiratory disease: a retrospective study
M T Shoemaker, M R Pierce, B A Yoder and R J DiGeronimo

High-flow nasal cannula as a device to provide continuous positive airway pressure in infants Journal of Perinatology (2007) 27, 772–775; doi:10.1038/sj.jp.7211828;
K L Spence, D Murphy, C Kilian, R McGonigle and R A Kilani

Work of breathing using high-flow nasal cannula in preterm infants
3. Monitoring compliance and effectiveness

<table>
<thead>
<tr>
<th>Element to be monitored</th>
<th>Ad hoc review of cases</th>
</tr>
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<tbody>
<tr>
<td>Lead</td>
<td>Mr Paul Munyard, Consultant Neonatology</td>
</tr>
<tr>
<td>Tool</td>
<td>Ad hoc review of cases</td>
</tr>
<tr>
<td>Frequency</td>
<td>annual</td>
</tr>
<tr>
<td>Reporting arrangements</td>
<td>Child Health Directorate Audit and Neonatal Clinical Guidelines</td>
</tr>
<tr>
<td>Acting on recommendations and Lead(s)</td>
<td>Dr Paul Munyard, consultant Paediatrician and Neonatologist</td>
</tr>
<tr>
<td>Change in practice and lessons to be shared</td>
<td>Required changes to practice will be identified and actioned within 3 months. A lead member of the team will be identified to take each change forward where appropriate. Lessons will be shared with all the relevant stakeholders</td>
</tr>
</tbody>
</table>

4. Equality and Diversity

4.1. This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the ‘Equality, Diversity & Human Rights Policy’ or the Equality and Diversity website.

4.2. Equality Impact Assessment
The Initial Equality Impact Assessment Screening Form is at Appendix 2.
Appendix 1. Governance Information

<table>
<thead>
<tr>
<th>Document Title</th>
<th>HEATED HUMIDIFIED NASAL CANULAE – USE OF VAPOTHERM FOR RESPIRATORY SUPPORT - CLINICAL GUIDELINE V1.0</th>
</tr>
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<tbody>
<tr>
<td>Date Issued/Approved:</td>
<td>6 December 2017</td>
</tr>
<tr>
<td>Date Valid From:</td>
<td>6 December 2017</td>
</tr>
<tr>
<td>Date Valid To:</td>
<td>6 December 2020</td>
</tr>
<tr>
<td>Directorate / Department responsible (author/owner):</td>
<td>Mr Paul Munyard Consultant Neonatology</td>
</tr>
<tr>
<td>Contact details:</td>
<td>01872 253293</td>
</tr>
<tr>
<td>Brief summary of contents</td>
<td>All clinical staff working in the Division of women, children &amp; sexual health to provide evidence based guidance in the use of Heated Humidified Nasal Canulae – Use Of Vapotherm For Respiratory Support</td>
</tr>
<tr>
<td>Suggested Keywords:</td>
<td>Heated Humidified Nasal Canulae Vapotherm Respiratory Support Paediatrics Neonatal</td>
</tr>
<tr>
<td>Target Audience</td>
<td>RCHT</td>
</tr>
<tr>
<td>Executive Director responsible for Policy:</td>
<td>Medical Director</td>
</tr>
<tr>
<td>Date revised:</td>
<td>6 December 2017</td>
</tr>
<tr>
<td>This document replaces (exact title of previous version):</td>
<td>New Document</td>
</tr>
<tr>
<td>Approval route (names of committees)/consultation:</td>
<td>Neonatal Guidelines Meeting</td>
</tr>
<tr>
<td>Divisional Manager confirming approval processes</td>
<td>David Smith</td>
</tr>
<tr>
<td>Name and Post Title of additional signatories</td>
<td>Not Required</td>
</tr>
<tr>
<td>Name and Signature of Divisional/Directorate Governance Lead confirming approval by specialty and divisional management meetings</td>
<td>{Original Copy Signed} Name: Caroline Amukusana</td>
</tr>
<tr>
<td>Signature of Executive Director giving approval</td>
<td>{Original Copy Signed}</td>
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**Publication Location (refer to Policy on Policies – Approvals and Ratification):**

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<th>Internet &amp; Intranet</th>
<th>✓ Intranet Only</th>
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</table>

**Document Library Folder/Sub Folder**

- Clinical / Neonatal

**Links to key external standards**


  Carlo Dani MD, Simone Pratesi MD, Claudio Migliori MD, Giovanna Bertini MD.

- Heated humidified high-flow nasal cannula: use and a neonatal early extubation protocol
  doi:10.1038/sj.jp.7211825; D Holleman-Duray, D Kaupie and M G Weiss

- High flow nasal cannula versus nasal CPAP for neonatal respiratory disease: a retrospective study
  doi:10.1038/sj.jp.7211647
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- High-flow nasal cannula as a device to provide continuous positive airway pressure in infants
  *Journal of Perinatology* (2007) 27, 772–775; doi:10.1038/sj.jp.7211828;
  K L Spence, D Murphy, C Kilian, R McGonigle and R A Kilani

- Work of breathing using high-flow nasal cannula in preterm infants
  doi:10.1038/sj.jp.7211530; J G Saslow, Z H Aghai, T A Nakhla, J J Hart, R Lawrysh, G E Stahl and K H Pyon

**Related Documents:**


  Carlo Dani MD, Simone Pratesi MD, Claudio Migliori MD, Giovanna Bertini MD.

- Heated humidified high-flow nasal cannula: use and a neonatal early extubation protocol
  doi:10.1038/sj.jp.7211825; D Holleman-Duray, D Kaupie and M G Weiss

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  K L Spence, D Murphy, C Kilian, R McGonigle and R A Kilani

- Work of breathing using high-flow nasal cannula in preterm infants
Training Need Identified? No

Version Control Table

<table>
<thead>
<tr>
<th>Date</th>
<th>Version No</th>
<th>Summary of Changes</th>
<th>Changes Made by (Name and Job Title)</th>
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<tr>
<td>06/12/17</td>
<td>V1.0</td>
<td>Initial Issue</td>
<td>Paul Munyard Neonatal Consultant</td>
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This document is to be retained for 10 years from the date of expiry. This document is only valid on the day of printing

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Appendix 2. Initial Equality Impact Assessment Form

This assessment will need to be completed in stages to allow for adequate consultation with the relevant groups.

<table>
<thead>
<tr>
<th>Name of the strategy / policy / proposal / service function to be assessed</th>
<th>USE OF A HEATED HUMIDIFIED CIRCUIT TO PROVIDE RESPIRATORY SUPPORT WITH BLENDED OXYGEN AND AIR VIA NASAL CANULAE IN NEONATES AT FLOW RATES &gt;1L/MIN. V1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Directorate and service area:</strong></td>
<td><strong>Is this a new or existing Policy?</strong></td>
</tr>
<tr>
<td>Neonatology</td>
<td>New</td>
</tr>
<tr>
<td><strong>Name of individual completing assessment:</strong></td>
<td><strong>Telephone:</strong></td>
</tr>
<tr>
<td>Mr Paul Munyard</td>
<td>01872 253293</td>
</tr>
</tbody>
</table>

1. **Policy Aim***
   **Who is the strategy / policy / proposal / service function aimed at?**
   All clinical staff working in the Division of women, children & sexual health to provide evidence based guidance in the use of a heated humidified circuit to provide respiratory support with blended oxygen and air via nasal canulae in neonates at flow rates >1L/min.

2. **Policy Objectives***
   As above

3. **Policy – intended Outcomes***
   As above

4. **How will you measure the outcome?**
   See section 3

5. **Who is intended to benefit from the policy?**
   All neonatology patients

6a Who did you consult with?

   b). Please identify the groups who have been consulted about this procedure.

<table>
<thead>
<tr>
<th>Workforce</th>
<th>Patients</th>
<th>Local groups</th>
<th>External organisations</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please record specific names of groups

Clinical Guideline Group
Child Health Directorate
7. The Impact
Please complete the following table. **If you are unsure/don’t know if there is a negative impact you need to repeat the consultation step.**

<table>
<thead>
<tr>
<th>Equality Strands:</th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
<th>Rationale for Assessment / Existing Evidence</th>
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<tbody>
<tr>
<td>Age</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (male, female, trans-gender / gender reassignment)</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race / Ethnic communities /groups</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability - Learning disability, physical impairment, sensory impairment, mental health conditions and some long term health conditions.</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religion / other beliefs</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Marriage and Civil partnership</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnancy and maternity</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sexual Orientation, Bisexual, Gay, heterosexual, Lesbian</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You will need to continue to a full Equality Impact Assessment if the following have been highlighted:

- You have ticked “Yes” in any column above and
- No consultation or evidence of there being consultation- this **excludes** any policies which have been identified as not requiring consultation. or
- Major this relates to service redesign or development.

What was the outcome of the consultation? | Guideline agreed
8. Please indicate if a full equality analysis is recommended.  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

9. If you are **not** recommending a Full Impact assessment please explain why.

No areas indicated

<table>
<thead>
<tr>
<th>Signature of policy developer / lead manager / director</th>
<th>Date of completion and submission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Paul Munyard</td>
<td>6th December 2017</td>
</tr>
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<table>
<thead>
<tr>
<th>Names and signatures of members carrying out the Screening Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dr Paul Munyard</td>
</tr>
<tr>
<td>2. Human Rights, Equality &amp; Inclusion Lead</td>
</tr>
</tbody>
</table>

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**Keep one copy and send a copy to the Human Rights, Equality and Inclusion Lead**
c/o Royal Cornwall Hospitals NHS Trust, Human Resources Department, Knowledge Spa,
Truro, Cornwall, TR1 3HD

**This EIA will not be uploaded to the Trust website without the signature of the Human Rights, Equality & Inclusion Lead.**

A summary of the results will be published on the Trust’s web site.

Signed Dr Paul Munyard

Date 6th December 2017