Neonatal Intubation and Management of the Difficult Airway Clinical Guideline

V1.0

November 2018
Summary

Infant Requiring Intubation (NNU, DS, Postnatal Ward)

Emergency Situation? (No cardiac output, unstable Airway)

Yes
Emergency checklist

No
Rapid Assessment of neonate
Drugs drawn up
Pre intubation checklist completed <1min

Successful intubation?

Yes
Complete post intubation procedure
Connect to ventilator

No
Follow failed intubation pathway
1. Aim/Purpose of this Guideline
1.1 Outline the process for emergency or elective intubation of neonates in NNU, DS or maternity wards by the neonatal team.
1.2 Outline the procedure for failed intubation / management of the difficult airway
1.3 Manage cases where additional preparation or procedures may need to take place prior or during intubation

2. The Guidance
2.1 Introduction
- In the emergency situation a priority is often establishing a definitive, secure airway to optimise resuscitation. The default option for this, in most neonatal cases, will be oral endotracheal intubation. This can often be achieved with the minimum of equipment and preparation. If complications occur, however a lack of preparation can result in a worse outcome.
- Intubation is not a procedure without risk and there is associated morbidity and mortality with intubation. Recurrent attempts at intubation in the extreme preterm neonate are associated with an increased risk of (intraventricular haemorrhage) IVH. Administration of medications may exacerbate or unmask cardiovascular instability.
- Intubation in anything but the emergency setting should always occur with the knowledge of the Consultant on call. Ideally there should be 2 operators competent in airway management of neonates present whenever one is to be intubated.

2.2 Pre-Intubation Assessment
- Baseline observations; including heart rate, respiratory rate, saturations, BP, capillary refill and assessment of perfusion and handling. Neonates with any signs of current or potential instability should have fluid boluses pre-drawn and ready to give. Consideration to pre-drawing doses of adrenaline should be made for any neonate rapidly deteriorating.
- Neonates with congenital cardiac disease may need different choice or doses of medications for intubation.
- Assessment of airway; Exclusion of obvious airway abnormality should occur pre-intubation. Intubation of neonates with Trisomy 21, micrognathia, craniofacial/neck abnormalities or clefts should be undertaken only by ANNPs, Senior Trainees or Consultants. Attendance of an ENT Consultant/ Registrar should be considered in any neonate with concern about airway abnormality.
- Patient positioning should be optimised. The incubator should be at an appropriate height for the operator; the patient should be accessible and placed so the head is midline, in line with the body. A neck/shoulder roll can be used if their airway position is not optimal due to large occipital size.
- Appropriate vascular access should be obtained pre procedure. Ideally an unstable neonate should have 2 points of IV access prior to administration of any medication.

2.3 Equipment
As a minimum the following equipment should be available: ( Additional airway equipment is in the bottom drawer of the emergency trolley.)
- Laryngoscope handle with appropriate size Miller blade (size 00, 0 or 1) Light should be bright, constant and remain on during extension of blade.
- Appropriate size ETT and next size down ETT, with introducer if required.
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- Paedicap EtCO2 / Waveform capnography if available (must be switched on and active)
- Appropriate sized ETT fixation device (Neobar) and correct tape.
- Nasogastric tube

- The area around the bed-space should be cleared to enable unrestricted access to the patient. Equipment at the bedside should be checked and include
  - Working suction with black suction catheter attached. A mini Yanker sucker should be available.
  - Neopuff with appropriate pressure and correct sized mask. 100% O2.
  - Continuous patient monitoring; Saturations, ECG heart rate, BP (either continuous if invasive or 5 minute cycle if NIBP) & respiratory rate.
  - Either a blanket or bubble wrap to allow thermal control during intubation
  - Ventilator connected, settings checked and ready.

- A copy of the intubation checklist and difficult airway algorithm is on the airway trolley.

2.4 Medication
The standard medication regime for intubation of neonates at RCHT is

- **Atropine: 20mcg/kg**
  Prevents/reduces bradycardia due to suxamethonium / vagal stimulation. Does not stop bradycardia due to hypoxia.

- **Fentanyl : 4 mcg/kg**
  Rapid onset analgesia/anxiolitic. May cause chest wall rigidity (if given fast, reverses with suxamethonium) or hypotension (consider reduced dose/ alternative agent in hypotension/unstable/complex congenital cardiac disease)

- **Suxamethonium: 2 mg/kg**
  Rapid onset short acting muscle relaxant. Partial effects may persist for up to 10 minutes. Caution in hyperkalemia. Caution in known Rubinstein-Taybi.

2.5 Staff Roles
2.5.1. Emergency intubation in the arrested/ peri-arrest patient should be performed by an experience practitioner.

2.5.2. In the stable neonate, having a non-emergency intubation, junior trainees (ST1-2) / trainee ANNPs can be allowed to intubate, providing the following procedure is followed:

- A senior trainee / Consultant / experienced ANNP should always be present and supervising. Maximum of 2 attempts
- The airway appears normal
- Neonate >27 weeks CGA
- Any significant cardiovascular or respiratory deterioration should result in a more experienced operator taking over.

2.6 Intubation
Once the neonate has been assessed, the equipment and area prepared and any drugs/ boluses pre-drawn, the neonate can be intubated.

The room should be quiet with minimal distractions. Parents have a right to remain, but they should be warned that they might find the procedure upsetting. They should have a staff member allocated to support them.
The tube should be passed through the cords under direct vision. If this does not happen first time follow the failed/difficult intubation pathway.

**2.7 Failed/Difficult Intubation Procedure**
If the initial attempt at intubation is unsuccessful a change should be made to the approach, positioning or technique of intubation. This could consist of:

2.7.1. Repositioning. Ensure head is line with midline and ear is at level of sternum. Ensure head is not overextended when airway is instrumented.

2.7.2. Use of larger/ smaller blade if view obscured. (consider 00 blade in <27 weeks). Use of smaller ETT if selected size does not pass through vocal cords

2.7.3. Laryngeal manipulation / Cricoid pressure / BURP- Backwards Upwards Right Pressure. The cords of neonates are often anterior. Ensure cricoid pressure is directly downwards (not pushing to left side of patient). Consider using right hand to move the larynx into view before asking assistant to hold whilst you intubate

2.7.4. Change of operator. If a more experienced operator is available no more than 2 attempts should occur before change in operator.

2.7.5. If a partial view of the cords is obtained or a smaller tube will not pass try passing a bougie before advancing the ETT over the top. A size 2.0 is in the emergency airway kit (consider in ex-prems if larger tube will not pass).

2.7.6. Video Laryngoscope or Airtraq. If the view is limited due to a small jaw/ abnormal airway consider using an alternative device. Both are available on NNU.

2.7.7. Laryngeal Mask Airway (LMA) if the patient is too unstable to “wake up” / apnoeic, and >2kg

2.7.8. Nasopharyngeal airway (NPA)- in infants with micrognathia / clefts. These can be used to give NIPPV via the ventilator.

2.7.9. Surgical airway- In a “can’t ventilate can’t oxygenate” situation (e.g. if tracheal atresia is suspected or if the upper airway anatomy prevents intubation and the infant is not stable without ventilation) then a surgical airway can be used. In this case both a Paediatric and ENT Consultant should be urgently called. It may be useful, out of hours to call for senior anaesthetic support (e.g. the ITU SpR) as they will be on site.

**2.8 Post Intubation Management**

2.8.1. Once the ETT is inserted correct placement should be confirmed both with capnography and by auscultation, ensuring equal air entry. Most ETT should be at around **Patient Weight (kg) + 6 cm (or use Neomate app)**. However this can be inaccurate and correct position should always be confirmed on auscultation and on CXR. The ETT should then be secured, surfactant given if necessary, and the infant connected to the ventilator.
2.8.2. The patients CO2 should be monitored using waveform capnography on NNU via the monitor.

2.8.3. A gas should be taken within 1 hour.

2.8.4. A CXR on all newly intubated infants should ideally be taken within 1 hour, although this can be delayed if other procedures are required.

2.8.5. A loading dose, followed by a continuous infusion of Morphine should be given to all ventilated infants to ensure they remain comfortable and improve ventilator compliance.

2.8.6. An appropriate ventilator mode in line with trust guidelines should be chosen.

2.8.7. Assessment of the infant who acutely deteriorates once intubated should follow the DOPE acronym:

D. Dislodged ETT (not at correct length, not ventilating, no EtCO2)- remove

O. Obstructed ETT (Tube at correct length, no/little EtCO2)- suction, if no improvement remove


E. Equipment failure. If all above negative and improves with hand ventilation consider equipment failure. Check all connections. If persists change ventilator.

2.9 Endotracheal Tube Change
Elective tube change should follow the same pre procedure as new intubation.

2.9.1. Instrument the airway to obtain a view of the current ETT passing through the cord.

2.9.2. Remove the old ETT and replace it with a new, all whilst maintaining a view of the cords.

2.9.3. Consider using a bougie, especially in the known difficult airway to maintain a path through the cords.

2.10 The Difficult Airway - Special Cases

2.10.1 Extrinsic Compression (e.g. Cystic Hygroma) / Micrognathia / Cleft Palate

- Airway management may be challenging and diagnosis is often made at delivery. If there is concern the airway may be difficult then a Consultant must be called, the difficult airway box ready and consideration of calling senior ENT support.
- Use of an NPA +/- NIPPV to prevent the need for intubation or allow time for more support is often appropriate. Consider nursing these infants prone (only when monitored).

2.10.2 Oesophageal Atresia
- If there is a tracheoesophageal fistula, intubating these neonates can precipitate progressive respiratory compromise due to non-decompressible abdominal distension. Intubation should only occur in cardiac arrest, apnoea or on advice of a tertiary unit consultant.

2.10.3 Congenital Diaphragmatic Hernia
- Early intubation following IM administration of muscle relaxants and opiates during delivery is the preferred management. See UHB neonatal guideline on management of these infants.

2.10.4 Sub-glottic stenosis / Tracheal stenosis / airway oedema
- May be congenital/ due to trauma, or secondary to prolonged ventilation in ex-prems. Utilisation of a smaller than expected ETT is often the only way to manage the airway. Pre extubation dexamethasone is sometimes used to reduce the airway swelling to facilitate extubation.

2.11 Pre-Intubation Checklist

### Challenge/Response
In emergencies only- use the Orange highlighted lines

| Decision |
|-----------------|-----------------|
| Why are we intubating the patient? | |
| Has the consultant been informed? | Y/N |

| Neonate |
|-----------------|-----------------|
| Is the neonate cardiovascularly stable? | Y/N |
| Do they have monitoring ECG Y/N | Sats Y/N | BP Y/N |
| Are airway issues expected? If so has senior /ENT support been called? | Y/N |
| Are they correctly positioned? | Y/N |
| Do they have functioning IV access? | Y/N |

| Equipment & Area |
|-----------------|-----------------|
| Is equipment ready? | Y/N |
| What size ETT? Introducer Y/N | Next size down ETT Y/N |
| Do we have access to the difficult airway kit? | Y/N |
| Do we need video laryngoscopy? | Y/N |
| Working laryngoscope? | Y/N |
| Is there working suction? | Y/N |
| Is the neopuff working and at the correct pressure? | Y/N |
| Do we have unrestricted access? Is the infant at the right height? | Y/N |

<p>| Team |
|-----------------|-----------------|
| | |</p>
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who is team leader?</td>
<td></td>
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<tr>
<td>Who will be first operator?</td>
<td></td>
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<tr>
<td>Who is monitoring the observations?</td>
<td></td>
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<tr>
<td>What is the backup plan? Who is second operator?</td>
<td></td>
</tr>
<tr>
<td>Who will be passing the ETT</td>
<td></td>
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<tr>
<td>Who is operating the suction</td>
<td></td>
</tr>
<tr>
<td><strong>Drugs</strong></td>
<td></td>
</tr>
<tr>
<td>Boluses/ Adrenaline needed? Drawn up?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Atropine (20mc/kg)?</td>
<td>Y/N</td>
</tr>
<tr>
<td>Fentanyl (4mcg/kg)?</td>
<td>Y/N</td>
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<tr>
<td>Suxamethonium (2mg/kg)?</td>
<td>Y/N</td>
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<tr>
<td>Surfactant needed?</td>
<td>Y/N</td>
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<td><strong>Final Checks</strong></td>
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<tr>
<td>Any final concerns</td>
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<tr>
<td>All job roles allocated</td>
<td></td>
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<tr>
<td>“Quiet Please”</td>
<td></td>
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<tr>
<td><strong>Proceed</strong></td>
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</tbody>
</table>
2.12 Failed Intubation Pathway- Including Difficult Airway

Checklist completed - Quiet Please

Plan A: First operator, first attempt

Successful?

Yes

No

Plan B- Make a change
Is the patient stable? Is the airway difficult?
Is a change of operator needed

Successful?

Yes

No

Plan C- Make a change
Is the patient stable? Is the airway difficult?
Most experienced operator must take over.

Successful?

Yes

No

Plan D- EMERGENCY- Call Consultant
Can the patient be woken? Naloxone?
Are repeat attempts necessary?
Can they be managed with face mask IPPV?
Are they appropriate for an LMA / NPA / OPA?

Patient not stable
“Can’t ventilate
Can’t oxygenate!”
- Call ENT
- Consider surgical airway
- Continue 2 person technique IPPV with airway adjuncts if necessary
- Pre-draw arrest dose adrenaline/volume

Patient stable
- Continue whichever support maintains patient stability
- If further attempts needed consider ENT involvement
- Ensure difficult airway is highlighted in all subsequent handovers

Changes to consider
- Check patient straight
- Check head position
- Try smaller ETT
- Try different blade
- Try bougie
- Relax Cricoid
- Bimanual laryngeal manipulation

Difficult airway
- NPA
- LMA (>2kg)
- Bougie
- Video Laryngoscope
- Airtraq
- ENT (fiberoptic intubation)

Always consider “Do I need more help?”

Successful Intubation
Confirm EtCO2
Check Air Entry
Secure ETT
Check Neonate
Document
CXR
Gas within 1 hour
Debrief
3. Monitoring compliance and effectiveness

<table>
<thead>
<tr>
<th>Element to be monitored</th>
<th>Neonatal Intubation &amp; Management of Difficult Airway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>Dr Paul Munyard</td>
</tr>
<tr>
<td>Tool</td>
<td>Audit</td>
</tr>
<tr>
<td>Frequency</td>
<td>As directed by audit findings</td>
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<tr>
<td>Reporting arrangements</td>
<td>Child Health Directorate Audit and Neonatal Clinical Guidelines</td>
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<tr>
<td>Acting on recommendations and Lead(s)</td>
<td>Child Health Directorate Audit and Neonatal Clinical Guidelines</td>
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<tr>
<td>Change in practice and lessons to be shared</td>
<td>Required Changes in Practice will be identified and actioned within 3 months</td>
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</tbody>
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4. Equality and Diversity

4.9. 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.

4.10. 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>Neonatal Intubation and Management of the Difficult Airway Clinical Guideline V1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Issued/Approved:</td>
<td>June 30th 2018</td>
</tr>
<tr>
<td>Date Valid From:</td>
<td>November 2018</td>
</tr>
<tr>
<td>Date Valid To:</td>
<td>November 2021</td>
</tr>
<tr>
<td>Directorate / Department responsible (author/owner):</td>
<td>Dr Paul Munyard, Consultant Paediatrician</td>
</tr>
<tr>
<td>Contact details:</td>
<td>01872252681</td>
</tr>
<tr>
<td>Brief summary of contents</td>
<td>Approach to Neonatal Intubations, management of complications and the difficult airway</td>
</tr>
<tr>
<td>Suggested Keywords:</td>
<td>Neonatal, Intubation, Airway, difficult airway</td>
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<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>30 June 2018</td>
</tr>
<tr>
<td>This document replaces (exact title of previous version):</td>
<td>Initial Version.</td>
</tr>
<tr>
<td>Approval route (names of committees)/consultation:</td>
<td>Neonatal Guidelines Group</td>
</tr>
<tr>
<td>Divisional Manager confirming approval processes</td>
<td>Tunde Adewopo</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}</td>
</tr>
<tr>
<td>Signature of Executive Director giving approval</td>
<td>Caroline Amukusana</td>
</tr>
<tr>
<td>Publication Location (refer to Policy on Policies – Approvals and Ratification):</td>
<td>Internet &amp; Intranet</td>
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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>30 June 2018</td>
<td>V1.0</td>
<td>Initial issue</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>Neonatal Intubation and Management of the Difficult Airway Clinical Guideline V1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directorate and service area:</td>
<td>Directorate and service area: Women, Children and Sexual Health</td>
</tr>
<tr>
<td>Name of individual completing assessment:</td>
<td>Name of individual completing assessment: Dr Chris Bell</td>
</tr>
<tr>
<td>Is this a new or existing Policy?</td>
<td>Is this a new or existing Policy? New</td>
</tr>
<tr>
<td>Telephone:</td>
<td>Telephone: 01872252681</td>
</tr>
</tbody>
</table>

1. Policy Aim*
   - Who is the strategy / policy / proposal / service function aimed at?
   - Aimed at clinical staff who manage newborns.

2. Policy Objectives*
   - Ensure appropriate assessment, preparation and management of all intubations occurring in RCHT on neonates by neonatal staff.

3. Policy – intended Outcomes*
   - Audit

4. *How will you measure the outcome?
   - Audit

5. Who is intended to benefit from the policy?
   - Neonatal patients

6a Who did you consult with
   - Workforce
   - Patients
   - Local groups
   - External organisations
   - Other
   - X

   **Please record specific names of groups**
   - Neonatal Guidelines group

What was the outcome of the consultation?
- Minor changes made
### 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>
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<td>No areas identified</td>
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<tr>
<td>Sex (male, female, trans-gender / gender reassignment)</td>
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<td>X</td>
<td></td>
<td>No areas identified</td>
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<tr>
<td>Race / Ethnic communities /groups</td>
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<td>X</td>
<td></td>
<td>No areas identified</td>
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<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>No areas identified</td>
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<tr>
<td>Religion / other beliefs</td>
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<td>X</td>
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<td>No areas identified</td>
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<tr>
<td>Marriage and Civil partnership</td>
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<td>No areas identified</td>
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<td>Pregnancy and maternity</td>
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<td>Sexual Orientation, Bisexual, Gay, heterosexual, Lesbian</td>
<td></td>
<td>X</td>
<td></td>
<td>No areas identified</td>
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</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

### 8. Please indicate if a full equality analysis is recommended.

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

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

No areas identified
Signature of policy developer / lead manager / director
Paul Munyard

Date of completion and submission
30 June 2018

Names and signatures of members carrying out the Screening Assessment
1. Paul Munyard
2. Human Rights, Equality & Inclusion Lead

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 _____PF Munyard____
Date ______30 June 2018___