

Document Title:	MANAGEMENT OF AN INFANT UNDER ONE YEAR ON THE CHILDREN'S WARD REQUIRING CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP)		
Document Reference/Register no:	07051	Version Number:	4.0
Document type: (Policy/ Guideline/ SOP)	Guideline	To be followed by: (Target Staff)	All healthcare professionals
Ratification Issue Date: (Date document is uploaded onto the intranet)	15 th May 2019	Review Date:	14 th May 2022
Developed in response to:	Best Practise		
Contributes to HSC Act 2008 (Regulated Activities) Regulations 2014(Part 3); and CQC Regulations 2009 (Part 4) CQC Fundamental Standards of Quality and Safety:			12
Issuing Division/Directorate:	Women's and Children's		
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Hospital Sites: (tick appropriate box/es to indicate status of policy review i.e. joint/ independent)	<input checked="" type="checkbox"/> MEHT <input type="checkbox"/> BTUH <input type="checkbox"/> SUH		
Consultation:	(Refer to page 2)		
Approval Group / Committee(s):	n/a	Date:	n/a
Professionally Approved by: (Asset Owner)	Dr Datta, Clinical Lead Paediatrics	Date:	9 th May 2019
Ratification Group(s):	DRAG Deputy Chair's Action	Date:	14 th May 2019
Executive and Clinical Directors (Communication of minutes from Document Ratification Group)	Date: May 2019	Distribution Method:	Intranet & Website

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Related Trust Policies (to be read in conjunction with)	<p>09052 Bronchiolitis in children 11046 Children and Young People (CYP) Observation Policy 11046 10102 Oxygen administration for children and young people 0-16 years 09005 Guidelines for Transferring children 0-16 years 04071 Policy for Standard Infection prevention precautions 08086 Clinical Record keeping Standards 07074 Neonatal Resuscitation</p>
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Document Review History:			
Version No:	Authored/Reviewer:	Summary of amendments/ Record documents superseded by:	Issue Date:
1.0	Andrea Stanley		February 2013
2.0	Andrea Stanley / Dr Alope Agrawal		31 May 2016
3.0	Mary Stebbens	Full Review	14 th May 2019

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1.0 Purpose

- 1.1 To provide guidance relating to the management of infants under one year who require continuous positive airway pressure (CPAP) on the children's ward.

2.0 Background

- 2.1 Continuous positive airway pressure (CPAP) is a type of non-invasive respiratory support that can only be used on a spontaneously breathing infant. A continuous oxygen and air mix is delivered under gentle pressure to the patient by appropriately fitted mask or nasal prongs secured in place.

- 2.2 Aim of nasal CPAP is to:

- Assist maintaining clear airflow through the airways;
- Improve alveolar gaseous exchange by recruiting collapsed or poorly ventilated alveoli;
- Improve oxygenation;
- Improve functional residual capacity (lung volume);
- Reduce the work of breathing.

3.0 Equality Impact Assessment

- 3.1 The Trust is committed to the provision of a service that is fair, accessible and meets the needs of all individuals.
(Refer to Appendix 2)

4.0 Scope

- 4.1 This guideline is for all clinical staff caring for infants under one year on the children's ward.

5.0 Staff Training

- 5.1 Clinical staff of all grades should be familiar with how to recognise seriously ill children and be able to perform paediatric life support. They should undergo re-training at the statutory intervals.
- 5.2 CPAP training will be provided with periodic retraining made available. A competency based assessment will need to be completed including both clinical and theoretical knowledge with regard to all aspects of caring for an infant whilst receiving nasal CPAP therapy.

- 5.3 Only trained and competent nursing staff should care for infants receiving nasal CPAP therapy
- 5.4 Registered nurses must comply with NMC standards for maintaining their knowledge and skills (NMC 2015).
- 5.5 During induction process nursing staff will receive instruction on current policy and guidelines.
- 5.6 Where a patient's notes have demonstrated that the appropriate action has not been taken a Datix is to be completed. This will address any further training needs for staff that requires updating.

6.0 Infection Prevention

- 6.1 All staff should follow Trust guidelines on infection control by ensuring that they effectively decontaminate their hands between each patient.
- 6.2 All equipment will be decontaminated between each patient and disposable single use items used where supplied.

7.0. Nasal CPAP Equipment used on the Children's Ward

- 7.1 Fisher and Paykel Bubble CPAP system.
- 7.2 The system is designed to deliver CPAP via short nasal prongs or nasal mask secured to a bonnet or headgear. Prongs, masks, bonnets and headgear are available in different sizes and it is important to ensure the correct size is used.
- 7.3 Within the children's ward setting it is suggested that 10kg weight or under 1 year of age is considered as the upper limit.
- 7.4 The nurse in charge of the ward should ensure that all equipment for resuscitation is immediately available and regularly checked.

8.0 Indications for CPAP

- 8.1 Within the children's ward nasal CPAP is used for infants under one year who have respiratory compromise caused by conditions such as bronchiolitis.
- 8.2 Clinical assessment by the paediatric registrar or consultant in conjunction with an experienced senior nurse (band 6 or 7) will determine the appropriateness of starting nasal CPAP.

- 8.3 Assess airway, breathing and circulation and complete a full physical examination. Exclude the need for immediate lifesaving treatment and ascertain the likely cause of the infant's respiratory distress and exclude any secondary causes.
- 8.4 Assessment of respiratory status should include:
- Respiratory rate;
 - Saturation oxygenation;
 - Fraction of Inspired oxygen (FiO²);
 - Respiratory effort;
 - Recession;
 - Grunting;
 - Nasal flaring;
 - Heart rate;
 - Temperature;
 - CEWT Score (Children's Early Warning Tool).
- 8.5 Further investigations should be considered to establish baseline biochemical/metabolic markers and assess the need for concurrent therapies and treatment. These should include:
- Full blood count;
 - Urea & electrolytes;
 - Blood cultures;
 - Blood gas analysis;
 - Chest X-ray.
- 8.6 Indications for commencement include:
- Signs of deterioration indicated by the CEWT score;
 - Increased respiratory rate of more than or equal to 60 breaths per minute;
 - Expiratory grunting;
 - Intercostal recession, sternal recession and nasal flaring;
 - Apnoeas and bradycardias (particularly in bronchiolitic babies);
 - Increasing oxygen requirements (i.e. FiO₂ more than 60% in oxygen);
 - Deteriorating blood gases (i.e. pH less than 7.25 with evidence of carbon-dioxide (CO²) retention);
 - Atelectasis shown on x-ray.
- 8.7 Once a baby has been commenced on nasal CPAP therapy, whatever the indication, the objective is to ensure that the nasal CPAP promotes optimum respiratory function and a patent airway is maintained in order to support breathing.

9.0 Contra-indications

- Known pneumothorax;
- Upper airway obstruction including croup, epiglottitis, suspected tracheitis;
- Following traumatic injury;
- Facial and nasal abnormalities;
- In the infant in whom improvement on nasal CPAP is unlikely and requires full mechanical ventilation e.g. underlying cardiac abnormalities, chronic lung disease, infants with complex medical problems i.e. chromosomal disorders, immunodeficiency;
- Caution required in infants with suspected abdominal distension.

10.0 Complications

- 10.1 The health professional caring for an infant on CPAP should be aware of the possible complication of nasal CPAP and take all the necessary precautions to ensure safe and effective application.
- 10.2 **Pneumothorax** must be considered if a baby on CPAP has a marked or rapid deterioration.
- 10.3 **Abdominal distension.** Some infants get significant abdominal distension during CPAP therapy. The risk of distension can be minimized by placement of an orogastric tube on free drainage whilst the infant is nil by mouth. Once orogastric feeding is commenced, aspirate air prior to each feed.
- 10.4 **Impedance of pulmonary blood flow** with increase in pulmonary vascular resistance and decrease in cardiac output may occur as a result of increased intrathoracic pressure with the use of inappropriately high CPAP pressure.
- 10.5 **Nasal Trauma** associated with nasal CPAP is an adverse event with potential short term or long term consequences. When carefully applied and monitored, the nasal CPAP device should provide a good seal without causing skin excoriation, pressure necrosis of the nasal tissue or pain. The risk of nasal trauma can be minimized by adherence to the recommended fixation technique and close observation by care givers.
- 10.6 **Failure to achieve desired CPAP pressures** can be due to:
- Inadequate seal by prongs or mask – always select appropriate size prongs/mask;
 - Dislodged prongs – check position regularly;
 - Infant has open mouth – use dummy to create a better seal;
 - Leak from circuit – check connections especially temperature probe site.

- 10.7 **Infant appears to 'dislike' nasal CPAP.** Some infants become very agitated whilst receiving nasal CPAP therapy. This may be due to a combination of the prongs/mask causing discomfort, the high flow of gas through the nose and the noise the gas flow makes in the nasopharynx. This should not be considered a contraindication for nasal CPAP if the infant clearly has indications for respiratory support. If the use of comfort measures fails to settle the infant, further action should be discussed with medical staff.

11.0 Issues to consider before commencing nasal CPAP therapy

- 11.1 In the event of an infant on the children's ward fulfilling the criteria for commencement of nasal CPAP therapy the following procedure needs to be followed.
(Refer to Quick reference Algorithm for management of nasal CPAP on the children's ward - Appendix 1)
- 11.2 Before commencing nasal CPAP discussion needs to take place between the paediatric registrar and the attending/on-call consultant paediatrician. The infant's suitability for nasal CPAP should be considered.
- 11.3 Inform the on-call anaesthetic registrar and ask them to assess the infant. It may be necessary to inform the on-call consultant anaesthetist should the infant's condition deteriorate and intubation is required.
- 11.4 **The Children's ward will only be able to care for two infants at any one time whilst on nasal CPAP.** If another child requires nasal CPAP at the same time Children's Acute Transport Service (CATS) will need to assist with the transport of that child to a high dependency unit/paediatric intensive care unit (HDU/PICU) elsewhere.
- 11.5 Senior nurse in charge of the children's ward needs to assess how the increased workload of an infant receiving nasal CPAP will impact on the ward. The senior nurse should ensure that there is an adequate number of staff on duty including one registered nurse competent in caring for an infant on nasal CPAP. This additional workload will continue until the infant is stable and nasal CPAP is discontinued.
- 11.6 Close observation and continuous monitoring using a multi-parameter monitor must be maintained by a competent registered nurse on a 1:1 (for an infant in a single room) or 1:2 basis (for an infant in the 2 bedded high dependency room) for the duration of nasal CPAP therapy.
- 11.7 Matron for children's and young people (CYP) (bleep #6555 3541) and/or clinical facilitator for children's acute care (bleep #6555 7042) to be contacted for support and advice and to inform them that there is an infant on the children's ward receiving nasal CPAP therapy.
- 11.8 Further support and advice can be obtained from staff on the Neonatal Unit.

- 11.9 Following the decision to commence nasal CPAP initiation should be supervised by paediatric registrar and/or consultant paediatrician.
- 11.10 In the event of deterioration contact the CATS (Tel: **0800 085 0003**) to discuss further the infants suitability for nasal CPAP on the children's ward and whether transfer of the infant to a HDU/PICU elsewhere would be more appropriate. CATS can provide clinical advice in the event that retrieval is thought not to be appropriate. Contacting CATS also provides advance warning of a child who may require retrieval should their condition deteriorate.

12.0 Inform Infant and Family

- 12.1 Ensure that the family is informed of the reason for the nasal CPAP including what it will involve, the benefits and possible complications and the likely impact on the infant and family.

13.0 Setting up Nasal CPAP

- 13.1 The infant should be transferred to a close observation cubicle or the high dependency room on the children's ward with an oxygen and air supply, suction equipment and multi-parameter monitoring equipment available.
- 13.2 Prepare and correctly set up bubble CPAP system and humidifier according to manufacturer's clinical manual.
- Standard CPAP pressure = 6 cm H₂O;
 - Standard gas flow level = 6 L/min.

14.0 Step by Step Fixation Technique

- 14.1 Measure infant's head circumference to determine size of bonnet/head gear used.
- 14.2 Two types of nasal interfaces are available
- Nasal prong: various sizes;
 - Nasal mask: small, medium, large.
- 14.3 Measure for prong/mask size using manufacturer's sizing tool. Record the information on the care plan.
- 14.4 Correct sizing is essential to prevent leakage and damage to the nasal septum.
- 14.5 Fit head gear and nasal interface to baby and connect to CPAP circuit as per manufacturer's instructions. Head gear should be lined with eyebrows and be pulled down over the ears and fit snugly to minimize movement of the tubing.

- 14.6 Turn on CPAP and ensure humidification is set to correct setting. Ensure bubble system and humidifier are kept lower than the infant. Secure tubing to avoid dragging on the circuit.
- 14.7 Set gas flow, water pressure and oxygen blender. Ensure system is fully operational before attaching to infant.
- 14.8 Connect bubble CPAP to infant by placing nasal prongs in nares and secure Velcro straps attached to head gear.
- 14.9 Final Check:
- Bonnet/head gear well down over the infant's head;
 - Ears well covered and flat against head;
 - Prongs/mask correctly positioned;
 - Nose in normal position not squashed or pulled upwards;
 - Eyes clearly visible;
 - Circuit is stable and secure;
 - Infant receiving required level of nasal CPAP.
- 14.10 Pass oro-gastric tube and record the size of the tube on the care plan.
- 14.11 Naso-gastric tube is not recommended as it can increase the work of breathing and disturb the seal within or around nose.

15.0 Ongoing Care and Monitoring of the Infant Receiving Nasal CPAP

- 15.1 All infants receiving nasal CPAP require:
- Continuous ECG monitoring;
 - Continuous oxygenation monitoring by pulse oximetry;
 - Blood gas analysis as medically indicated.
- 15.2 Check position of circuit, bonnet/head gear and nasal prong/mask hourly to ensure stable and comfortable fixation.
- 15.3 Ensure eyes visible and not subjected to escaping airflow as excess airflow will damage the delicate surface and underlying structures.
- 15.4 Ensure the nose is in a normal position and is not pushed superiorly or laterally to avoid nasal damage.
- 15.5 Provide rest periods from nasal prongs alternating to nasal masks to allow natural humidification of nasal passages and escape of secretions and to avoid damage to nasal mucosa.

- 15.6 Provide gentle nasal massage at least every 4 hours (with nasal prongs removed) (No creams or ointments to be applied) to provide pressure relief, promote localised blood flow and to avoid nasal/septal damage and necrosis.
- 15.7 Ensure the prongs are kept clean and free from any secretion obstruction every 4 hours to provide optimum delivery of nasal CPAP.
- 15.8 Check and record humidifier temperature hourly to ensure correct humidification and temperature are being delivered. Ensure water is in the humidifying chamber.
- 15.9 Check and record the set CPAP pressures and gas flow hourly to ensure optimum CPAP is maintained and delivered.
- 15.10 Replace CPAP circuit and humidification system every 7 days or when visibly soiled to prevent accumulation of microbes (infection prevention measure).

16.0 Airway Assessment

- 16.1 Listen for any noises from the airway and mouth which may indicate potential obstruction. It is important to assess need for suctioning to ensure patient comfort, reduce risk of deterioration and avoid risk of aspiration.
- 16.2 The aim of the humidification system used with the device is to prevent damage to the respiratory tract, keeping the airway/secretions moist to prevent the formation of thickened secretions and mucus plugs. Care should be taken to ensure the tubes from the humidifier to the infant are free from condensation as this may impede the gas flow to the infant causing deterioration in the infant's condition. Water in the tubes should be drained back into the humidifier. It is also important to drain the CPAP circuit before repositioning the infant to prevent condensation.
- 16.3 Nasal suctioning does not need to be carried out routinely. Some oral secretions may be evident which may be suctioned gently if necessary. Any of the following may indicate the need for suction and the infant will need careful assessment:
 - Increased oxygen requirement;
 - Increased work of breathing;
 - Increased recession, apnoeas, respiratory distress;
 - Increased secretions.
- 16.4 If suction does not improve the baby's condition within a few minutes then medical review is indicated.
- 16.5 Assess the need for sedation and administer **only** if prescribed by the consultant paediatrician or registrar to enable CPAP to be delivered effectively.

17.0 Breathing Assessment

- 17.1 Ensure appropriate position of the infant to aid optimal chest expansion and reduce work of breathing whilst also promoting comfort.
- 17.2 Observe for signs of respiratory distress. These include the use of accessory muscles, recession, tachypnoea, tachycardia, pallor and increased effort or tiring. This may indicate that CPAP may not be being effectively delivered or the infant's condition may be deteriorating.
- 17.3 Monitor infant's oxygen saturations continuously. Any decrease in oxygen saturations may indicate that CPAP is not being effectively delivered.
- 17.4 Record oxygen saturations, oxygen requirements, respiratory rate and chest movement at least hourly as condition indicates. Any increase in oxygen requirements may indicate that the overall condition of the infant is deteriorating and further management may be required.
- 17.5 Record CEWT score at least hourly to detect early any deterioration in condition.
- 17.6 Ensure clinical re-assessment of chest (including chest movement and air entry) is carried out by a paediatric registrar (or above) at least hourly initially and then as clinically required at a minimum of every 4 -6 hours for the duration of nasal CPAP therapy. This allows the infant's progress to be monitored and to detect signs of deterioration quickly.
- 17.7 Ensure that regular blood gas samples are taken for the duration of nasal CPAP therapy. Initially 30 minutes to 1 hour after commencement of nasal CPAP and as clinically required thereafter. This is normally every 4-6 hours; but in some clinical situations, a blood gas may need to be taken every 1-2 hours. This enables close monitoring of infant's respiratory and metabolic progress whilst ensuring comfort and rest.

18.0 Circulatory Assessment

- 18.1 Attach cardiac monitor to infant and continuously monitor heart rate and rhythm.
- 18.2 Record heart rate at least hourly or more frequently as condition indicates.
- 18.3 Record blood pressure at a minimum of every 4 hours.
- 18.4 Record CEWT score at least hourly.
- 18.5 Ensure that regular mouth care is carried out every 2 – 4 hours. Circle the oral cavity with gauze dipped in sterile water to keep the mouth free of infection. The use of a

dummy helps create a better seal for CPAP and also encourages non-nutritive sucking in the tiny infant.

- 18.6 Assess infant's ability to feed safely and provide gastric tube feeds and / or intravenous hydration as prescribed (NB: Prevention of aspiration essential).
- 18.7 Provision of adequate nutrition is essential in the growing and developing baby and metabolic demands increase in illness. CPAP is not an absolute contra-indication to feeding but consideration is required regarding the infant's overall ability to feed safely.
- 18.8 If not able to feed record blood glucose 4 – 6 hourly. Prolonged starving and increased respiratory effort may lead to a falling blood glucose level which may need correction.
- 18.9 Infant must have a patent intravenous cannula in situ. The infant may need intravenous fluids and /or medication. Should the infant's condition deteriorate then intravenous access may be difficult to obtain.
- 18.10 A strict fluid balance record should be kept to ensure the infant maintains a reasonable fluid balance. Monitor the urine output to ensure that the infant excretes a minimum of 2ml/kg/hour.

19.0 Handling and positioning

- 19.1 All care, including repositioning, nappy changes and mouth care should be performed at the same time to allow the infant to rest. Constant handling will increase the baby's stress level and its breathing effort.
- 19.2 Infants should be repositioned every 3-4 hours to reduce facial oedema, pooling of secretions and reduce pressure marks. Infants can be positioned side to side or prone if fully monitored.

20.0 Discontinuing Nasal CPAP

- 20.1 Discontinuation of CPAP is considered by the multidisciplinary team when the following criteria have been met:
 - General condition of the baby is stable;
 - FiO₂ requirements are minimal (less than 40%);
 - CPAP levels are minimal;
 - Blood gas levels are within normal or acceptable limits.
- 20.2 When the infant is taken off CPAP it should be started on oxygen therapy via nasal cannula either low flow or high flow (Optiflow) as clinically indicated.

- 20.3 Once off CPAP the infant should be monitored closely over the next 24 hours to ensure it does not get tired and need to re-start CPAP again.

21.0 Normal Blood Gas Values

- pH: 7.36 – 7.45
- PCO₂: 4.7 – 6.0 kPa
- PO₂: 10 – 13 kPa (in air)
- HCO₃: 22 – 26
- Base Excess: -2 to +2

(Advanced Life Support Group (2016) Advanced Paediatric Life Support (6th edition)

22.0 Audit and Monitoring

- 22.1 Any instances of non-compliance with this guideline should be recorded on a risk event form in accordance with the Incident Policy. This will address any training needs for staff that require updating.
- 22.2 Case notes will be reviewed annually to assess compliance to these guidelines.

23.0 References

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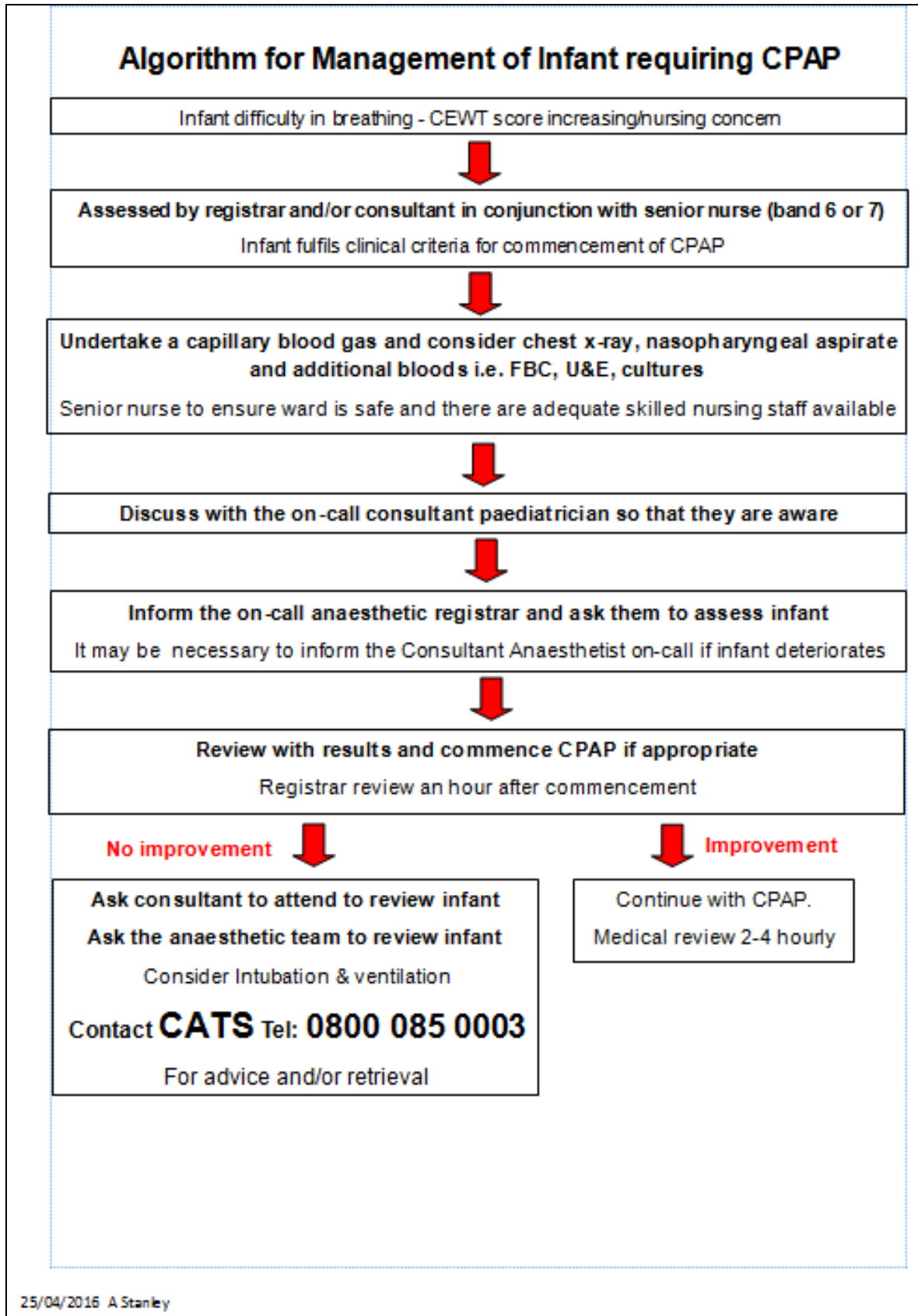
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www.nmc.org.uk/standards/code

Appendix 1



Appendix 2: Preliminary Equality Analysis

This assessment relates to: 07051 Management of an Infant on the Children's Ward Requiring Continuous Positive Airway Pressure (CPAP)

A change in a service to patients		A change to an existing policy	X	A change to the way staff work	
A new policy		Something else (please give details)			
Questions		Answers			
1. What are you proposing to change?		Full Review			
2. Why are you making this change? (What will the change achieve?)		3 year review			
3. Who benefits from this change and how?		Patients & Clinicians			
4. Is anyone likely to suffer any negative impact as a result of this change? If no, please record reasons here and sign and date this assessment. If yes, please complete a full EIA.		No			
5. a) Will you be undertaking any consultation as part of this change? b) If so, with whom?		Yes Refer to pages 1 & 2 consultation			

Preliminary analysis completed by:

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