

THAMES VALLEY & WESSEX NEONATAL OPERATIONAL DELIVERY NETWORK

THAMES VALLEY SURFACTANT TREATMENT GUIDELINE FOR NEONATAL UNITS

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Distribution	Thames Valley Neonatal Clinical Forums Thames Valley and Wessex Neonatal Network website Thames Valley and Wessex Neonatal Network e-bulletin
Related documents	<p>References</p> <ol style="list-style-type: none"> 1. Sweet DG, Carnielli V, Greisen G, et al. European consensus guidelines on the management of respiratory distress syndrome -2016 update. <i>Neonatology</i>. 2017; 111: 107-125. 2. Rojas-Reyes MX, Morley CJ, Soll R. Prophylactic versus selective use of surfactant in preventing morbidity and mortality in preterm infants. <i>Cochrane Database Syst Rev</i>. 2012 Mar 14; 3: CD000510. 3. Dargaville PA, Aiyappan A, De Paoli AG et al. Continuous positive airway pressure failure in preterm infants: Incidence, predictors and consequences. <i>Neonatology</i> 2013; 104: 8-14. 4. Brix N, Sellmer A, Søndergaard M, Jensen L, Vad Pedersen L, Brink Henriksen T. Predictors for an unsuccessful INTubation-SURfactant-Extubation procedure: a cohort study. <i>BMC Pediatrics</i> 2014, 14:155. 5. Dargaville PA, Gerber A, Johansson S, De Paoli AG, et al. Incidence and Outcome of CPAP Failure in Preterm Infants. <i>Pediatrics</i>. 2016; 138: DOI 10.1542/peds.2015-3985. 6. Aldana-Aguirre JC, KisvardaPinto M, Featherstone RM, Kumar M. Less invasive surfactant administration versus intubation for surfactant delivery in preterm infants with respiratory distress syndrome: a systematic review and meta-analysis. <i>Arch Dis Child Fetal Neonatal Ed</i> 2017; 102: F17-23.

Implications of race, equality & other diversity duties for this document	This guideline must be implemented fairly and without prejudice whether on the grounds of race, gender, sexual orientation or religion.
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1.0 Aim of Guideline

This guideline aims to provide a consistent approach to the use of exogenous surfactant in neonates across Thames Valley.

Please see guidance on “Initial Resuscitation and Stabilisation of Preterm Infants” for the general approach to delivery suite management in preterm infants.

2.0 Scope of Guideline Framework

The guideline applies to all Neonatal Units covered by Thames Valley Neonatal ODN. This includes the following hospitals:

Thames Valley	
Buckinghamshire Healthcare NHS Trust	- Stoke Mandeville Hospital, Aylesbury
Frimley Health NHS Foundation Trust	- Wexham Park Hospital, Slough
Milton Keynes University Hospital NHS Foundation Trust	- Milton Keynes General Hospital
Oxford University Hospitals NHS Foundation Trust	- John Radcliffe Hospital, Oxford
Oxford University Hospitals NHS Foundation Trust	- Horton General Hospital, Banbury
Royal Berkshire NHS Foundation Trust	- Reading

3.0 Surfactant Treatment

Background

Exogenous surfactant has been shown in numerous RCTs to reduce the risk of pneumothorax and neonatal death in infants with RDS. More recent studies demonstrate that early CPAP and selective use of surfactant improve mortality and rates of chronic lung disease compared with a policy of prophylactic surfactant. Brief intubation combined with surfactant application followed by extubation (INSURE) has been advocated as a means to minimise mechanical ventilation times. More recently, an approach of surfactant replacement without intubation, coined LISA (less invasive surfactant application) has been advocated based on very promising data from several large RCTs.

Please see guidance on “Early respiratory management of preterm infants” for the general approach to delivery suite management in these infants.

Indications for Surfactant

- All infants <28 weeks who need **early intubation in delivery suite**
- **Early rescue** (within 0 - 2 hours of life)
 - For all neonates ≥28 weeks who require ventilation beyond initial resuscitation in delivery suite and are thought to have diagnosis consistent with RDS.

- For infants on non-invasive respiratory support who show clinical signs of RDS and require a $FiO_2 > 0.3$ to maintain adequate SpO_2 .
- Consider additional top-up surfactant to 200mg/kg for larger infants who have received prophylactic surfactant in delivery suite but whose FiO_2 remains > 0.3
- **Rescue treatment** of RDS (in first 24 hours) in any infant
- **Retreatment** - consider retreatment within 12 hours if still ventilated and O_2 requirement $> 40\%$ or $> 30\%$ with significant CXR changes
- **Third dose** may be beneficial in some patients and should be a consultant decision
- **Possible secondary surfactant failure** - Consider in infants with Meconium Aspiration/ Pulmonary Haemorrhage/ Severe Pneumonia– this should be a consultant decision.

Dose

The licensed dose for Poractant alpha (Curosurf) is 100-200mg/kg. Higher doses are associated with reduced mortality and reduced need for repeat treatment doses. This guidance ensures pragmatic use of whole vials where possible whilst ensuring that doses at the higher end of the treatment range are used. For twins, consider splitting a larger vial/(s) as the cost is less per ml of surfactant.

- **Prophylaxis in Delivery suite – 1x120mg vial Curosurf** – top up to 200mg/kg for larger infants if ongoing $FiO_2 > 0.3$ following admission to NICU
- **Early Rescue/Rescue treatment – 200mg/kg**

Weight	Dose in mls	Vials of Surfactant
≤ 0.6 kg	1.5mls	1x 120mg
0.7-1.2kg	1.75-3mls	1x 240mg
1.3-1.8kg	3.25-4.5mls	1x120mg and 1x240mg
1.9-2.6kg	4.75-6mls	2x240mg

- **Re-treatment – use whole vials to give a minimum of 100mg/kg**

Weight	Dose in mls	Vials of Surfactant
≤ 1.2 kg	1.5mls	1x 120mg
1.3-2.4kg	3mls	1x 240mg
2.5-3.6kg	4.5mls	1x120mg and 1x240mg

Administration Techniques

Surfactant administration for infants receiving non-invasive respiratory support is either by **Less Invasive Surfactant Administration (LISA)** or by **Intubate SURfactant Extubate (INSURE)**. The indications for using the two techniques are shown below alongside the indications for intubation and ongoing ventilatory support. Individual cases may be discussed with the consultant in charge.

<u>LISA (all must apply)</u>	<u>INSURE (all must apply)</u>	<u>Intubation, surfactant & ongoing ventilation (any apply)</u>
Infants > 26 weeks (Consultant discretion for infants < 26 weeks)	Infants < 26 weeks Infants > 26 weeks where ongoing ventilation may be required	
Respiratory support only required at delivery	Respiratory support only required at delivery	Cardiac compressions or intravenous drugs required at resuscitation

Regular spontaneous respiration after caffeine administration	Regular spontaneous respiration after caffeine administration AND following INSURE procedure	Irregular/inadequate respiration
FiO ₂ >0.3 but < 0.6 at start of procedure and FiO ₂ ≤0.3 at end of procedure	FiO ₂ >0.3 but < 0.6 at start of procedure AND ≤0.3 at end of procedure	FiO ₂ ≥0.6 at start of procedure and/or >0.3 at end of procedure
Inotropic support <10mcg/kg/min dopamine	Inotropic support <10mcg/kg/min dopamine	Requiring inotropic support ≥10mcg/kg/min dopamine
No other organ failure	No other organ failure	1 or more organ failure

LISA (Less Invasive Surfactant Administration) to be administered by an experienced doctor/ANNP

- Have full ETT intubation set prepared, in case intubation should become necessary.
- Prescribe and draw up Fentanyl, Atropine and Suxamethonium in weight appropriate doses used for intubation. (Suxamethonium is NOT needed for LISA, only if intubation becomes necessary).
- Please also prescribe Naloxone, in case the effect of Fentanyl needs reversal.
- Remove Curosurf from fridge and aim to warm to room temperature before use
- Gently turn it upside down – DO NOT SHAKE
- Draw up Curosurf in a standard 2.5ml syringe (with Luer lock) using a blunt intravenous needle, and connect syringe to LISA catheter for application. Do not use the standard 'Surfactant giving set', as this syringe won't connect to the LISA catheter.
- Maintain nHFT/ nCPAP throughout the procedure.
- Use swaddling and sucrose as comforting techniques and consider proceeding with LISA if the baby is settled.
- If the baby is unsettled or it is the consultant's choice to use analgesia pre-medicate with 1/3 dose of Fentanyl (0.67mcg/kg) and full dose of Atropine. If the baby becomes apnoeic after Fentanyl administration, it may be necessary to use mask inflation breaths and Naloxone (10mcg/kg) administration.
- Insert LISA catheter below the vocal cords via direct laryngoscopy:
 - 1cm for 25-26 weeks GA,
 - 1.5cm for 27-28 weeks GA and
 - 2cm for 29-32 weeks GA
 - Note catheter marking at the lips for later reference. The position should equate to ETT at lips for conventional intubation.
- Carefully remove laryngoscope taking care not to dislodge the catheter and recheck LISA catheter position by checking catheter markings at the lips.
- Slowly (!) give Curosurf 200mg/kg with maintenance of nHFT/nCPAP:
 - With the infant in a supine position and head in the midline, inject the surfactant as small boluses of approximately 0.2ml aliquots every 5-10 breaths (give full dose over 2-4 min).
 - Higher aliquots may increase likelihood of overspill into mouth and oesophagus. Reduce volume of aliquots or wait for longer periods between aliquots if overspill occurs.
 - Usually, suction of overspill surfactant is not required – if patient remains stable, allow time to clear spontaneously.
 - Expel all the surfactant from the catheter by injecting 0.5 ml of air following administration.
- Remove catheter once Surfactant administered and continue CPAP/ nHFT.
- Following procedure, change infant position from supine to prone position to allow better Surfactant spreading and distribution for the first 30min unless urgent UVC/UAC required (ensure peripheral access for dextrose whilst respiratory status is stabilising over first 1-2 hours).
- Repeat the exercise in the event of on-going high FiO₂ after 2 hours.

INSURE (INTubate SURfactant Extubate)

- Use standard premedication intubation drugs and doses (Fentanyl, Atropine, Suxamethonium – see intubation guideline)
- Ensure correct tube placement using correct tube length for gestation (see network resuscitation cards), visual check for chest rise, auscultation and end-tidal capnography (Neo-StatCO2 or Pedi-Cap).
- Remove Curosurf from fridge and aim to warm to room temperature before use
- Gently turn it upside down – DO NOT SHAKE
- Draw up Curosurf using ENTRAL surfactant kit
- Place head in midline and administer whole dose swiftly using the ENTRAL surfactant blue catheter
- Take care to insert the catheter only to the depth shown below to avoid excursion of the catheter out of the end of the ET tube:
 - Size 2.0 = 17 cm
 - Size 2.5 = 18 cm
 - Size 3.0 = 19 cm
 - Size 3.5 = 20 cm
- Following administration, give a few manual inflation breaths, observe chest rise whilst surfactant is being distributed
- Changes in lung compliance will occur within minutes of administration of Curosurf;
 - in delivery suite, reduce PIP to achieve ongoing chest rise and reduce FiO₂ according to oxygen saturation nomogram
 - in the NICU, set ventilator on SIPPV +VG (choose appropriate tidal volume, 5-8ml/ kg bodyweight) and titrate FiO₂ to maintain normal oxygen saturation – avoid hyperoxia
- Extubate as soon as sedation has weaned off, spontaneous breathing is evident and FiO₂ has reduced <0.3.
- If oxygen requirement is low but baby remains apnoeic for a prolonged period (>30 mins) consider giving **Naloxone 10mcg/kg** to reverse the effect of the opiate but be aware that the half life of Naloxone may be shorter than that of fentanyl necessitating a further dose within 1-2 hours (Naloxone ½ life 1.2-3 hours, Fentanyl ½ life 2.5 hrs approx.).
Perform a blood gas within 30-60 minutes of giving surfactant

Version Control:

Version	Date	Details	Author(s)	Comments
3	May 16	New Guideline, modified from OUH guideline Feb 2016 2017 LISA and reference update	Dr E Adams Dr C Roehr	Ratified <i>Note versions 1&2 OUH Guidelines</i>
4	Jan '17	Updated. Naloxone and Luer lock	Dr E Adams Dr C Roehr	Minor updates agreed and completed.
5	Sept 2020	Updated. Non-pharmacological sedation for LISA	Dr E Adams Dr C Roehr Dr K Ives	Ratified at Governance December 2020
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