Bradford Teaching Hospitals
NHS Foundation Trust

Early Care of the Preterm – BEACON guideline

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Bradford Early Care Of Very Preterm Neonates

Based on previous drafts originating from Nottingham guideline

Scope

This guideline deals with aspects of stabilisation of very preterm infants (<32 weeks gestation).

Introduction

The CESDI 27-28 week project[1] highlighted deficiencies in resuscitation and early care in many babies born at 27 or 28 weeks gestation as well as communication within teams and with families. Remarkably, these themes are resonant still, although medical and nursing care has evolved enormously since the 1990s. This guideline aims to set out a means to deal with the issues around early stabilisation of very preterm infants (<32 weeks gestation) in the Bradford clinical context. The guideline also aims to address many of the recommendations of the CESDI report, as well as reflect more recent emerging evidence.

Sick newborn infants tolerate both handling and hypothermia poorly. Minimal handling and maintenance of normal temperature are paramount. Monitors should be used to provide observation of the infant where practical, even in delivery suite, and an arterial line inserted if more than occasional blood gas measurements required. Painful procedures should be kept to a minimum and babies observed constantly during them for hypoxaemia and hyperoxia.

A key aim in the immediate stabilisation is to enable infants to establish some functional residual capacity. This may be achieved with prophylactic CPAP from birth, mask ventilation and then prophylactic CPAP or prophylactic or therapeutic intubation with ventilation and surfactant administration, according to the clinical situation. It is vital to remember that the overwhelming majority of preterm babies will breathe soon after birth (80% of babies <28 weeks REF O donnell), making assisted ventilation with mask inflation or endotracheal intubation unnecessary, and arguably harmful.

This guideline has been modified from previous versions in order not to deviate from NLS guidelines. However, it is noteworthy that the NLS guidelines only partly accommodate the vulnerability of the preterm lung to excessive volutrauma. There is a widely held view that optimal early care minimises later BPD. In using an NLS consistent approach, Bradford based clinicians should be mindful that there is evidence in humans that sustained inflations of a longer duration than those recommended in NLS are known to be harmful [ref Kirplani]. Animal evidence also shows that sustained inflations appear harmful[5,6,7]. So, caution to avoid excessive tidal volume should be excercised such as using the lowest pressures consistent with adequate ventilation and oxygenation when ventilating with a T piece, using volume cycled ventilation (“VG”)

In Bradford we aim to stabilise, admit and put lines into the most vulnerable babies within an hour of admission and then leave them as undisturbed as possible.

Evidence

Timing of Cord Clamping

Some certainty now exists about the optimal timing of cord clamping for preterm babies. (see separate guideline). Aiming to deliver deferred cord clamping leads to a major improvement in mortality. There is interest in, but no real evidence base supporting the use of, stabilisation with cord intact. Cord intact stabilisation is therefore not standard of care.

Bradford Approach:

Currently at BRI our standard is to aim for 1 minute of deferred cord clamping for preterm infants, unless clinical condition dictates immediate clamping. The antenatal presentation might inform this assessment – for example a decision for immediate cord clamping of completely apnoeic 30/40 baby might be hastened by knowledge the CS was done for fetal bradycardia.

We have found that prior discussion of a plan to deliver deferral of cord clamping is helpful, to ensure that both obstetric and neonatal teams understand mutual expectations, and to facilitate any necessary changes to the plan if indicated. Elevation of the baby prior to cord clamping is contraindicated. Leaving the baby undisturbed is best, once a plastic bag (and a hat at vaginal deliveries) is applied.

Indications for immediate cord clamping are discussed in the relevant guideline.

A key priority during a period of deferral is to establish if the baby is breathing – it will affect what you do next.

Thermoregulation

It has long been recognised that Neonatal mortality increases with falling admission temperature[3]. In the Epicure study hypothermia was independently associated with the risk of death[4]. A recent trial where the control arm babies were colder did not show such a difference in mortality, although secondary outcomes still differed – worse with hypothermia. While some would argue as to whether a truly causal relationship exists between hypothermia and death or illness, clinical observation suggests that hypothermia is so easily abolished that aggressive thermoregulatory support is appropriate. In utero temperature is around 37.8^{0}C and the agreed YNN standard is to admit babies with a temperature of ≥36.5^{0}C.

Bradford Approach:

It is unknown whether iatrogenic hyperthermia is harmful, but it seems prudent to avoid overwarming. Overwarming is possible with a "bag, hat and radiant warmer" approach particularly if an exothermic mattress is used in a larger baby. For this reason we usually limit use of exothermic mattresses to babies known to be cold (ie temperature < 36.5^{0}C). We have found it helpful to monitor temperature in real time with a skin probe underneath the baby, or in an axilla if a mattress is being used. However, measuring a temperature using a bedside thermometer at ten minutes of age, and subsequently prior to leaving delivery suite after a delivery room cuddle, if one is taking place, is considered standard of care.

Apply plastic bag, and hat if at vaginal delivery, prior to cord clamping. We aim to admit babies normothermic (36.5 – 37.5^{0}C).

Early respiratory management

CPAP: Recent studies have examined the extent to which CPAP (without prior administration of surfactant) may be seen as an alternative to prophylactic intubation[8,9]. Use of CPAP seems to avoid iatrogenic harms associated with intubation and ventilation. The interpretation of these studies makes clear the importance of early ventilation strategies that are as close to "physiological" as possible – minimising excessive tidal volume, oxygen toxicity and promoting early removal of any ET tube. These studies suggest that this approach may be seen as equivalently efficacious in preventing death or chronic lung disease.

Surfactant:. Preterm animals ventilated without PEEP have reduced compliance, increased alveolar protein leak and more histological lung injury than those ventilated with PEEP. These changes are seen within 10 minutes of birth.

A school of thought in the early part of the last decade suggested that the appropriate response to these data is to minimise such lung injury by administering surfactant prophylaxis to a subset of babies as early as practicable. Where the operator is certain of successful intubation, this can be before the first assisted breath. Where intubation is part of delivery suite management, we believe such prophylaxis is still appropriate. Babies intubated are not normally electively extubated until they are within the neonatal unit.

Bradford Approach:

We aim to admit almost all babies less than 32 weeks gestation on CPAP. Babies who are breathing during a period of deferred cord clamping should usually be tried on CPAP. The same is true for babies with other signs of vigor (movements) in whom breathing cannot clearly be ruled in, or out. Bradycardia that is improving spontaneously with CPAP is neither an absolute indication for mask inflation nor intubation.

We prefer to deliver CPAP using binasal prongs ("purple circuit" – see relevant guidance) or a "short prong" – which is essentially an ET tube cut down and with a tape flag preventing its passage more than 4-5cm into the nasopharynx. You may find it helpful to "seldinger" this prong through the nares over a short length of nasogastric tube. This prong can then be attached to the PEEP circuit and the circuit adjusted to deliver approximately 5-6cm H20 of PEEP. Short prong CPAP should be used for transfer and can also be used briefly in an incubator if a CPAP driver is not yet ready on arrival on the neonatal unit, despite the lack of humidity. Face mask CPAP is often attempted, and clearly can be delivered on occasion. However, it is known that face mask application can cause a vagal stimulus via the trigeminocardiac reflex and still more importantly can cause upper airway obstruction. If the latter occurs, the baby will appear to be breathing but may be unable to achieve gas exchange. Short prong CPAP and use of binal prongs are simple, easy and appears effective.

No specific gestation is excluded from a trial of CPAP. However we accept that many of the least mature (for example <26/40) infants will require elective intubation and ventilation for respiratory insufficiency mediated both through lung disease and also skeletal and muscle weakness. Such babies, and all less than 28 weeks who are intubated in delivery suite, should receive surfactant as soon as possible after intubation.

Adequate exposure (12 hours or more) to antenatal steroids should influence decision making as to whether elective surfactant use should be considered at very low gestations. Further aids to decision making should include the general vigor (movements) of the infant, respiratory effort and heart rate during and after any period of deferred cord clamping. Absolute indications for intubation include failure to improve a slow HR by mask inflation in an apnoeic baby, and "excessive" work of breathing or pauses in breathing. The latter judgement requires significant clinical experience – at higher gestations work of breathing that initially appears marked may become more acceptable even with some initial oxygen requirement. In intubated babies, we aim to proceed to intubation as soon as possible after making the decision to avoid inconsistent ventilation and to administer surfactant. We do not use the INSURE techniques. LISA is the subject of a separate guideline. Preterm babies who are intubated in delivery suite should not normally be electively extubated prior to admission to the neonatal unit.

Where neither elective intubation nor an early trial of CPAP are clearly indicated – for example in the case of persistent apnoea in a steroid exposed baby at say 29 weeks, a period mask inflation to try to stimulate respiration and support establishment of FRC is indicated.

Where mask inflation is performed in a very preterm infant, pressures of 25/5 should be commenced. Use of 2-3s 'inflation breaths' is considered reasonable. Decreasing PIP to the lowest value consistent with adequate chest movement and improving heart rate and SpO2, for example to 20/5 should be considered.

CPAP "Failures": Post admission it is known that some babies started on CPAP will need ventilation[8,9], and the threshold at which to intervene with optimal timing is unknown. Too low a threshold will result in too many babies being ventilated; too high a threshold will result in the known advantages of earlier surfactant administration being lost[10]. We are confident in conventional means of surfactant administration to treat or provide prophylaxis against hyaline membrane disease. We aim to have very short intubation durations, without using INSURE. Some intubated babies need more than a single dose of surfactant. See *LISA guideline*.

Bradford Approach

We choose to treat babies with evidence of established hyaline membrane disease (ie a sustained oxygen requirement at rest of 30% or more or other evidence of respiratory failure) with either LISA or intubation, early rescue and extubation as soon after as the baby is clinically fit for extubation (many minutes to hours or even days). A 30% threshold for intubation of babies on CPAP should be interpreted with the whole clinical and therapeutic picture. A CPAP mask or prongs that are too tight seems to occlude the nares, and can certainly cause trauma. Some leak can be compensated for by increasing the flow. It is important to ensure that the baby has the opportunity to be settled on CPAP, prone if possible, while getting a CPAP of 5-6cm H2O. Babies who are already surfactant exposed might be suitable for a higher threshold for intervention – discuss with consultant.

Air/ O2: Studies in term infants suggest a possible benefit, and certainly no downside to commencing resuscitation in air. Normal term and preterm infants have low saturations in the early minutes of life, which does little to encourage one to administer supplementary oxygen. Our experience has been that many preterm infants can be stabilised in air and any risk of early hyperoxia abolished. In contrast, there are certainly cases where preterm infants are slow to respond without increased supplemental oxygen. .

Bradford approach

NLS guidelines recommend starting in 30% oxygen – a willingness to wean oxygen after birth is appropriate. In general, an SpO2 that is slowly rising reflects a healthy transition to ex utero life. We should increase the FiO_2 in the presence of persistent bradycardia which is not responding to airway and breathing management. Careful studies have shown that newborn infants do not have saturations in the first few minutes that we would recognise as normal later in life[11].

In intubated babies, it is not known if increasing the PIP or FiO_2 should be the first manoeuvre in those babies whose HR does not respond to intubation, and surfactant. Where intubation is certain and bradycardia persists, increase in pressure beyond 25 cm H_2O seems reasonable, and in very exceptional cases PIP may need to be much higher.

Ongoing ventilation

Ventilation appears to be part of the downside to a prophylactic intubation approach. Therefore rapid weaning is appropriate. Different ventilation modes have advantages and disadvantages and choice should be discussed with the senior clinician.

Bradford approach

Our standard approach to ventilation is PC-AC + VG with an initial tidal volume set at 4ml/kg (PIP limit of 28, or 10 above requirements – whichever is lower). Volume guarantee (VG) is only successful if the flow sensor is working normally and ET tube leak is below 50-60%. Babies with established respiratory disease – for example an oxygen requirement of more than 30% - may require higher tidal volumes and may benefit from more surfactant and possibly other treatments.

Please see the guideline on *Neonatal Ventilation* for further details.

Communication

We make every effort to communicate with families before preterm delivery. This is particularly true for infants where a significant morbidity or mortality risk is to be expected (e.g. <30 weeks), but is important to all families, as is quick relaying of information about their baby's progress at and after admission. Document antenatal

conversations in the maternity EPR, and postnatal conversations on "yellow sheets" in the baby's notes. It is also good practice, if at all possible, to encourage parents to visit the neonatal unit prior to delivery.

"Borderline" gestations: At very low gestations reviews of results of neonatal intensive care suggest that survival rates are low and many survivors have significant disabilities. In Bradford we have previously taken the view that it is inappropriate to resuscitate infants of less than 23 completed weeks gestation, in common with our neonatal services[12]. However, recent guidelines suggest a more considered approach to decisions about postnatal stabilisation may be appropriate (see appendix 2).[14] These should be read. Ensure calculation of gestation is exact and agreed. The obstetric team will wish to have neonatal input at gestations below 23 weeks. This may involve talking to parents antenatally about whether intensive care is appropriate or being present at the delivery to assist with palliative care. Neonatal input of this kind requires considerable experience and should only be undertaken after discussion with the neonatal consultant on-call.

For babies at 23 weeks or below gestation, the neonatal team (usually a consultant) must discuss the situation with the family prior to the delivery and agree a planned approach. Joint meetings between the family and a neonatal and obstetric consultant are the best way to show professional care and consensus and should be considered the optimum approach.

A "comfort care only" plan will typically involve baby being wrapped and handed to parents without efforts being made to resuscitate the baby, and may include neonatal staff not attending the delivery. Families and professionals need to anticipate that babies may gasp or even breathe at very low gestations – this will l need to be discussed with parents and professionals.

Under certain circumstances it is also acceptable to agree antenatally with parents not to resuscitate infants at slightly higher gestations[12]. A consultant needs to be involved in this decision making. Postnatal assessment showing a baby in parlous condition at birth might reinforce such a decision. However at 24 weeks or beyond decision a postnatal assessment with an expectation of providing attempted intensive care is usually necessary. Calculation of exact gestation, by a neonatologist, is obviously vital and helpful to show the family that the gestation has both been considered and is critical.

Attending deliveries where death is expected: While it is without the "resuscitation" aspects of this guideline – very occasionally medical staff from NNU may be asked to attend the delivery of a liveborn infant for whom no intensive care is either anticipated, nor appropriate. This will be when no obstetric member of staff is able to attend, and ensures a death certificate can be written without the involvement of the coroner. A certifying doctor must have seen the baby before death. Prior clear communication with midwifery staff as to the reason for attendance is, as ever, clearly vital. Junior trainees should not be asked to attend the deliveries of babies below 23 weeks gestation. Adhering to, and consideration of modifying, a plan for non-intervention at delivery, takes considerable experience.

Preparation (applies to all <32/40)	
Checklist	**Comments**

• **Incubator** set up and pre-warmed (see monitoring and thermoregulation table)
• **Humidity** on and at 60% when delivery anticipated (increase when procedures completed. See monitoring and thermoregulation table)
• **Ventilator and Tom Thumb** plugged in and working (Tom Thumb at 20/5, air, flow 7 lpm, Ventilator PC-AC + VG, VT 4ml/kg, Ti - insp time 0.3, rate 50)
• **Suction** working, catheters present
• **Monitors** - all with **appropriate attachments** e.g. cables and probes
  ○ Pulse oximeter, ECG for HR
  ○ Invasive blood pressure with transducer
  ○ Temperature thermistor
• **UAC and UVC trolley** set up on NNU (at least for babies <28 weeks)
• Ensure **resuscitaire** is set up on delivery suite
  ○ Intersurgical variable PEEP circuit connected available to deliver CPAP Pressures 25/5, set to deliver FiO2 30%,
  ○ Autobreath circuit available
  ○ Plastic bag ready
  ○ On "Manual" heat output, set to maximum, Skin Temp probe inserted but shielded from radiant heat,
  ○ Both gas cylinders contain adequate gas (needle pointing straight up is OK)
	• Use Draegar incubator C2000e
	• Use incubator in "air" mode – servo exacerbates swings in temperature.
	• Use high room temperatures to minimise rainout in double walled incubators.

• **Nurse** who will care for admission is identified and work distributed accordingly • **Coordinator** should attend deliveries <32/40 • **Consultant/ SpR/ SHO** aware of delivery • One person delegated to bring **"Curosurf"** (one 120mg vial per baby, if <28/40) • **Discuss management plan for birth and outcomes with parents**. Give BLISS parent book on outcomes for extremely premature babies. • • **Emergency trolley** checked and available • **<u>Clarity among team as to approach to be taken, and who will do what. Discuss with delivering midwife/ obstetrician as to plan for cord clamping</u>**	• Neonatal nurse and coordinator will attend all deliveries <32/40 • Make consultant aware of deliveries <28/40 – will aim to be present unless trainee nearing completion of training is to be present • The amount of information given at this stage should be tailored to the individual family and timescale for delivery. • **Mortality data Remember** mortality rates will vary depending on time point e.g. pre-birth, birth, admission to NNU, 1st week. See appendix 1 • **Morbidity** – at least mention risk of later developmental problems. • Delivering interventions depends on all knowing who is doing what, when and why.

When the baby is born (<27/40) - see also additional guidance for <24/40	
Actions	**Rationale and comments**

• Place baby in plastic bag during period of 1 minute deferred cord clamping, put hat on baby (unless CS)
•
	• To ensure adequate maintenance of temperature
	  ○ Activate Transwarmer (at room temperature, away from heater). Cover with towel.
	  ○ Place baby directly in a plastic bag, without drying, at birth.
	  ○ Ensure plastic bag covers as much of baby as possible. Ensure tight seal to prevent draught and evaporative heat loss. Make small hole for left hand for SpO2 monitor. If access required for UVC, cut small hole.
	  ○ Place a woollen hat on baby's head, without drying it.
	  ○ Do not cover baby with towels until heater switched off immediately before transfer

• Use FiO2 30% for breathing support • Increase to O_2 if persistent bradycardia, may be appropriate to increase PIP prior to increasing FiO_2 • Use **PEEP circuit** for breathing support, using PEEP 5, unless needing ventilation breaths	• In animal work PEEP is as important as early surfactant in the establishment of FRC. • Add oxygen if not responding after intubation, surfactant and appropriate inflation (see comments in introduction) • PEEP circuit allows delivery of CPAP or conversion to mask inflation. Autobreath circuit useful for ongoing ventilation (e.g. intubated baby)
• If decision for intubation - attempt within 30 seconds of decision • Tube position may be confirmed by • Direct vision • Videolaryngscopic insertion • HR improvement with ventilation • Clear misting inside ETT • Pedicap Ensure ETT is not inserted too far Surfactant (Curosurf 120mg, one vial) administered once ETT in correct position Minimise delay • Initial PIP 25 – increase if persistent bradycardia • Decrease PIP if ventilating well	• Allows airway control and very early surfactant • Significant chest movement may represent excessive tidal volume for some babies. • Use surfactant administration packs Unsuccessful intubation in active spontaneously breathing baby – may consider CPAP
• Inexperienced personnel, unable to intubate, • Gentle mask inflation, 2-3s inflation breaths (see above) max initial pressures 25cm H_2O. Monitor effect by assessing heart rate. • Use "difficult airway" guideline (attached to emergency trolley)	• Use PEEP circuitDo not use bag, valve mask system - cannot control pressure • Call SpR /consultant if not already present • Call paediatric ward SpR if difficulties with intubation and consultant not yet available

• Non responders:
  ○ Is baby intubated?
  ▪ Pedi-cap
  ▪ Direct Laryngoscopy
  ▪ Auscultation
  ○ Is ETT too far in?
  ▪ Review tube length compared to original intubation
	• Best test of intubation is seeing tube pass through cords
	• Pedi-cap can be useful confirmation of successful intubation, but beware false negatives (Insufficient pressure/ tidal volume, poor cardiac output)
	• Rise in SpO_2 is not an appropriate test of successful intubation.
	• Rise in HR can be useful confirmatory evidence of ETT placement
	• Surfactant should be administered as soon as confidence in intubation is achieved – not be necessary to await change on Pedicap

▪ Auscultation ○ Is PIP sufficient? ○ Is FiO_2 sufficient? ○ Have you waited sufficient time? ○ Did surfactant enter lungs?	• Consider repeat surfactant if ETT shown to be in oesophagus at any time
• Apply SpO_2 probe and plug into Masimo monitor (kept on trolley)	• Apply lead to baby before plugging into (turned on) monitor. • Apply lead to baby's right hand (cut hole in plastic bag for hand)
•	
•	

When the Baby is born < 32/40	
Actions	**Rationale and comments**
• Place in plastic bag and put hat on during deferred cord clamping, before commencing stabilisation	
• Start delivery of CPAP **short cut ETT**, unless assessed as not breathing (typically during DCC)	• Promote alveolar recruitment and may prevent hyaline membrane disease • Preferred technique is ETT cut short, and passed via nares
• Gentle mask ventilation breaths via PEEP circuit if not breathing, no inflation breaths, initial PIP 20cm H_2O. Monitor effect by assessing heart rate until SpO2 available. • Do not plan to give prophylactic surfactant on delivery suite, unless known not be steroid exposed or other known risk factor for bad outcome • Note that no evidence guides the use of drugs if they are apparently required to achieve cardiac output.	• Surfactant to be given to intubated babies as soon as possible and within 30 minutes of birth. • Elective intubation may be appropriate for immature or very SGA babies (eg at 27, 28 weeks) if baby has not had exposure to full course of antenatal steroids (<12 hours). Bradford team remain very aware that concentration on use of drugs may detract from clinical focus on airway and breathing interventions – which are most likely to be important in achieving good outcome.

Transfer to NNU – All Babies <32/40	
Actions	**Rationale and Comments**
• Fix ETT prior to transfer • Use short prong CPAP or purple circuit approach (see relevant guideline). Transfer on resuscitaire	• Ensure pads are well stuck to face and Velcro tight, (clean face if necessary gently with towel/ saline and cotton wool) • • Short tube CPAP appears effective and avoids risk of occluding upper airway with mask pressure during stabilisation and transfer..
• Do not disconnect from power until ready to go • Cover in warm towels immediately prior to transfer • Show baby to parents – encourage mother to touch baby. Record whether this occurred	• Power off stops alarms
• Ensure sufficient gases before leaving delivery suite • Ensure cord pH samples taken (all <28/40, and all LSCS)	• Air and oxygen must be full enough for transfer. Remember to check fullness of cylinders with cylinder turned on but wall gas not applied. "lefty loosie", "righty tighty"
• Consider offering father/ one relative a brief visit to NNU as baby is brought round, then return him to delivery suite until stabilisation complete.	• May decrease family anxiety if they know where baby has gone, pending later visit from senior member of medical staff.

Admission – All Babies <32/40	
Actions	**Rationale and comments**
• Nurse caring for baby may need assistance from others, but remains with baby for duration of admission. • Coordinator can provide or delegate this role.	• Identified nurse provides continuity and gets help from others with drugs etc
• Initial actions o Weigh baby in plastic bag o Transfer to incubator still in bag o Attach to ventilator/ CPAP o Reassess ABC o Give surfactant if intubated and not already given, assess response	• Ti 0.3s, PEEP 6, PIP and FiO_2 as at resuscitation. • Is baby on appropriate ventilatory support? Review chest movement and VT.
• Nursing admission procedure o Take axilla temperature using electronic thermometer. If low and skin temp normal, repeat ideally using "direct" "Filac" thermometer. o Commence monitoring (skin temp, ECG, SpO2) o Record baseline observations o Give Vitamin K o Photograph baby for parents	• Medical staff/ANNP prepare to insert umbilical lines giving nursing staff time to complete initial admission procedures • Target admission temp 36.8°C. Avoid temp>38°C • Lie baby on skin temp probe – no tape is needed • No ECG leads <26/40 (causes skin damage), source heart rate from SpO_2 until UAC HR available.
• Do not remove bag until all procedures (UAC etc) complete and humidity and incubator temp optimised • "Pull" a hole in the bag for access to umbilicus	• Minimise use of sharps in incubator
• Monitor oxygenation/ blood gas o SpO_2 target - see SPO2 guideline o $PaCO_2$ 5-7kPa	

Admission – All Babies <32/40 (continued)	
Action	**Rationale and Comments**
Intubated babies • Site umbilical arterial and venous lines where a senior decision indicates they are needed. Many babies less than 32 weeks will need central venous access for parenteral nutrition, but not all. UAC placement is indicated where there is significant respiratory disease or if very low gestation means invasive blood pressure monitoring and frequent sampling are needed. o UAC for IBP and HR monitoring – ventilated babies and those with significant oxygen requirement o Double lumen UVC o Operator attaches UAC fluids, once both lines in using clean technique with help of admitting nurse. • **Take blood for** o ABG o CRP (if sepsis considered) o Blood glucose (as part of gas) o FBC o Blood Group and Coombs o Blood culture o Start maintenance fluid 75ml/kg 10% glucose. **Target time for both IV and IA fluids up is 60 minutes after birth** Prescribe prophylactic antifungal prophylaxis	**Arterial access is easiest in 1st hour –do not delay** **UAC** o Commence 0.9% saline with heparin (1iu/ml) at 0.5-1ml/hr o Monitor heart rate via UAC. Ensure alarms on monitors set correctly. **UVC** o Use a double lumen UVC (with tip placed just outside right atrium). If difficult to obtain use a single lumen UVC o A sterile procedure should be used to access line (use Matching Michigan techniques and insertion checklist) o The UVC tip must lie at or immediately above the diaphragm on X-ray. If it lies kinked within the liver then the catheter should be removed. o All drugs including PN can be given through it if the UVC tip lies in the IVC or right atrium o Give maintenance fluid 75ml/kg Babiven startup through UVC whilst awaiting X-ray. **Do not delay the administration of drugs or fluids before the X-ray is available.** Lines must be placed by a skilled practitioner to avoid delays, learners may assist Attending nurse may make up and attach IV fluids before procedure completed, **Care must be taken not to pull out line accidentally.** **Do not site peripheral line** o **<28/40 within first 24 hours,** o **Defer peripheral IV in babies <26/40**

Subsequent Care	
Actions	**Rationale and Comments**
• Reassess 1 hour after admission	• Structured assessment of oxygenation, CO2 clearance, temp (Axilla T) and appearance as well as brief examination (OFC, anus, morphology, skin etc – not hips) is key part of admission documentation. Quality notes matter.
• If ventilated and <30% O_2 and good CO_2 clearance with low PIP, aim for early extubation. Load with caffeine. Extubate baby to CPAP using "extubation to CPAP" guideline.	• Babies <26/40 should be discussed with consultant on call before moving to extubation.

• If needing 30-50% O_2 continue PC-AC+ VG (if sensor working normally). Aim for TV 4-6ml/kg (usually started at 4ml/kg). Discuss with consultant as to whether further surfactant is indicated.
• Consider also
  ○ ETT position
  ○ Sufficient surfactant in correct place
  ○ Pneumothorax
  ○ Pneumonia/ Pulmonary hypoplasia/ hypertension
  ○ Does baby need HFOV?
	• Avoid "volutrauma" – i.e. the traumatic effect of excessive tidal volume and overdistension – is as important as the old concept of "barotrauma" delivered during attempts to progressively recruit collapsed alveoli

• If FiO_2 >30%: has baby had sufficient surfactant?	• Consider ETT position? Big leak?
• Chest and Abdominal x-ray (after NGT passed)	• Immediately after UAC and UVC are in position. • If no umbilical lines and not ventilated delay until 4 hours of age
• Explain reason for admission and care baby is receiving to both parents. Encourage early visit, avoiding time of ward round. • Discuss expressing, and ensure practical advice "showing you what to do" is given. • Give milk as available – 0.5ml/h does not require any medical decision	• Document meeting between member of senior medical staff and parents in notes, ideally within 1 hour of birth, certainly within 12 hours of delivery. • Document that "Bliss family handbook" given to mother/ father.
• Suctioning	• Not routinely required in 1st 12 hours post surfactant. Perform when there are clinical features suggestive of ETT obstruction.

Monitoring and Thermoregulation						
Parameter	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Stop**	**Comment**
Monitoring						
SpO_2	Continuous	Continuous	Continuous	Continuous	WR decision, when stable in air	Ongoing whilst receiving supplementary O_2 Target SpO2 according to guidelines
Heart Rate	Continuous	Continuous	Continuous	Continuous	WR decision	Source from BP if <27/40 for first 4 days Place leads laterally on chest wall to maintain XR quality
Blood Pressure MAP > gestation	Continuous if UAC in situ If no UAC, 1 -2 hourly depending on gestation			Continuous if UAC in situ	WR decision	NI BP cuff can damage skin and is unreliable. Ideally arterial.
Thermoregulation						
Temperature	Continuous	Continuous	Continuous	Continuous		D14 onto 3-6 hrly

Humidity <28/40 gestation	85%	85%	85%	85%		85% till D7, then wean 5% BD Stop D10
Humidity 28-32/40	85%	80%	75%	70%		Wean by 5% daily, stop at D10

Initial Incubator settings

<28/40	**(<1.0kg)**	**37ºC**
28-32/40	**(1.0-1.5kg)**	**35ºC**
32-34/40	**(1.5-2.5kg)**	**34ºC**
>34/40	**(>2.5kg)**	**33º C**

*If babies are admitted with an appropriate temperature, i.e. ≥ 36.8 ºC.
If admitted with hypothermia then an increased incubator temperature may be required to warm the baby up promptly. Pressing the ">37 ºC" button, allows the incubator to be adjusted to higher termperatures.

Nursing Procedures <32/40						
Parameter	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Review/stop**	**Comment**
Nutritional needs						
Weight	Twice daily weight for all babies <27/40 first 4 days Daily weight 27- 32/40				Twice weekly D10 ealier if WR decision	
Fluids						Amount of fluid should be based on daily U&E's, weight and fluid balance
Breastmilk	Ensure support offered, and booklet given out. Feed any available milk at up to 0.5ml/h without seeking medical input into decision.	Check out expression progress				See " Guideline for the Expression, Preparation, Storage and Safe use of Breast Milk"
Nappies	Weigh 6 hourly	Weigh 6 hourly	Weigh 6 hourly	Weigh 6 hourly	Review weighing nappies at D7	
Urinalysis	Daily	Daily	Daily	Daily	Daily whilst on TPN	May need BD if glycosuria, hyperglycaemia present or abnormal urine output

Cares						
Nappy change/hygiene	6/12 hrly	6/12 hrly	6/12 hrly	6/12 hrly	D7 6 hrly nappy Daily top and tail	Dust with CX powder at cares
Positioning Supportive	Side lying	Prone/ side lying	Prone/ side lying	Prone/ side lying	Prone for maximum respiratory support, consider developmental care.	Side lying first 24 hrs- observe UAC/ UVC site Use positioning and developmental aids
Handling	Minimal	Minimal	Minimal	Minimal		Cluster handling episodes, avoid over stimulation

5. References

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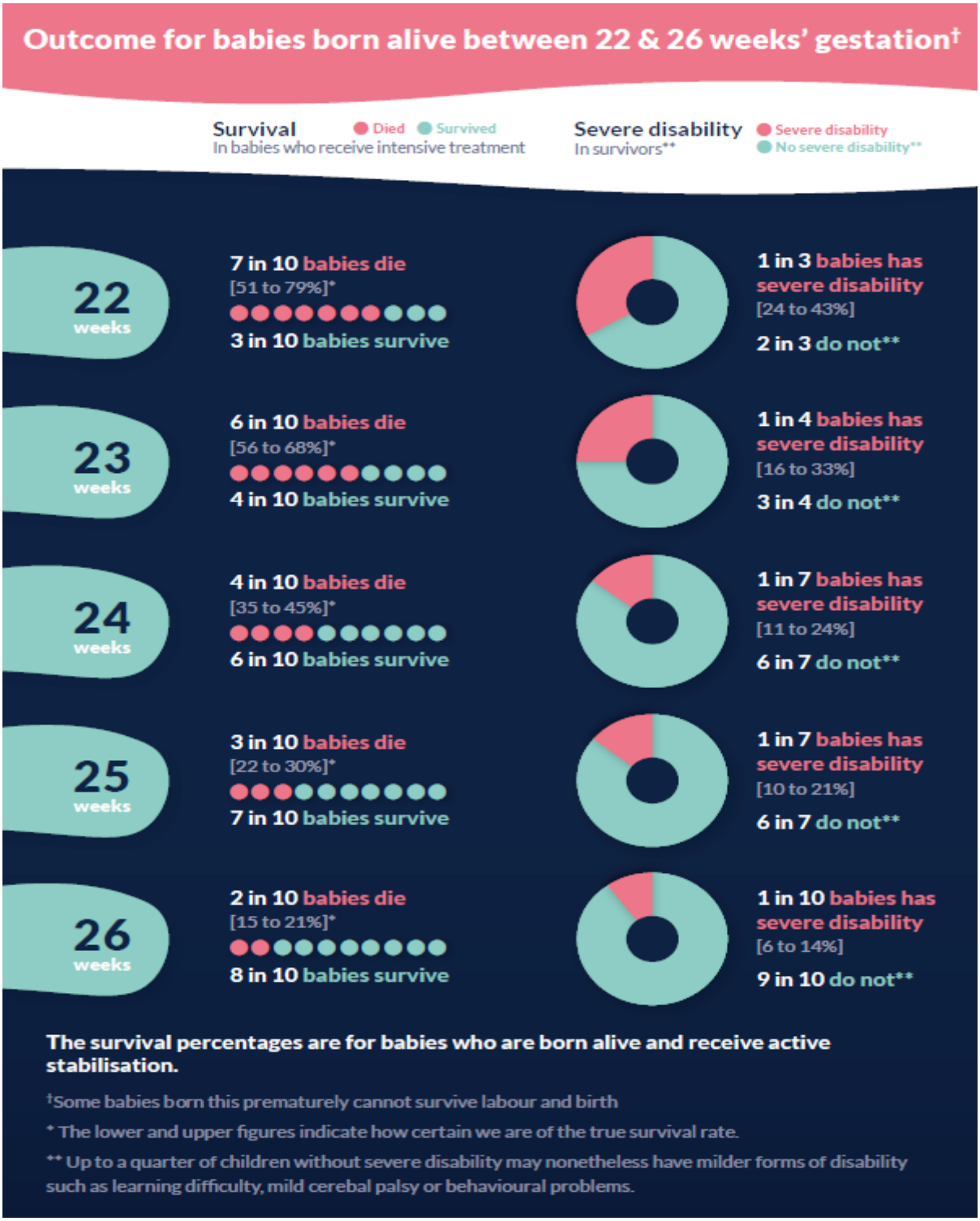
Appendix 1 Perinatal Management of Extreme Preterm Birth Before 27 weeks of Gestation (2019) A BAPM Framework for Practice



Appendix 2 Perinatal Management of Extreme Preterm Birth Before 27 weeks of Gestation (2019) A BAPM Framework for Practice – Proposed visual tool for assessment of risk