

Newborn Critical Care Center (NCCC) Clinical Guidelines

Early Management of Extremely Low Birthweight (ELBW) Infants

QUALIFICATIONS: Neonates < 28 weeks gestation for whom full resuscitation is to be provided

DELIVERY ROOM MANAGEMENT

Prior to delivery assign team roles:

Two experienced providers (neonatal fellow, attending neonatologist, neonatal nurse practitioner), two experienced nurses (charge RN and an additional experienced RN) and one experienced RT will attend delivery and directly participate in delivery room and admission care. See [ELBW Golden Hour Provider Role Assignments](#) for details.

Set-up in NCCC prior to delivery:

- Preheated isolette with pre-warmed memory foam positioning aide
- D10W ready on pump: IV tubing with medline primed to start on admission
- Umbilical line tray, catheters and supplies including D5W flushes ready on procedure cart
- Pre-warmed D10W with 2.5% amino acid solution and 0.5 units/1 mL heparin primed through IV tubing with medline, ready to start
- Pre-warmed isotonic 3.6% amino acid solution and 1 unit /1 mL heparin primed through IV tubing, ready to start
- RT to set-up bubble CPAP and ventilator at the bedside for infants 25 weeks and above

Set-up in DR prior to delivery:

- Turn thermostat in room up to at least 74° Fahrenheit
- Sterile warm blanket or towel wrap for delayed cord clamping
- RT to pre-warm surfactant, set up CPAP, and prepare laryngoscope, ETT, duoderm, and elastic tape for securing ETT
- Use T-piece resuscitator with initial settings: FiO₂ at 0.21, PIP 16 and PEEP +6 cm H₂O
- Ensure both the standard preemie and micro-preemie face masks are available
- Pre-heat radiant warmer, blankets and hat; open sterile plastic wrap/thermoregulation suit
- Open temperature probe cover and cut in half. Prepare a thin piece of duoderm to apply to infant's skin underneath temperature probe.
- Open micro-preemie, non-adhesive pulse oximeter probe and micro-preemie CR leads
- Open/activate disposable warming mattress **just prior to delivery** (do NOT pre-heat)

At Delivery:

- Delay cord clamping for 60 seconds with OB provider stimulating infant in warm, sterile cloth "nest" – if NOT responsive, proceed to resuscitation
- Receive infant in sterile plastic wrap and warmed blankets
- Dry infant with gentle patting – **DO NOT** rub dry
- Apply half gold heart temperature probe over a thin layer of duoderm on the skin and switch radiant heat warmer to infant temperature control

- Apply micro-preemie, non-adhesive pulse oximeter probe and micro-preemie CR leads
- Place PIV using gentle, low-adhesive, blue tape to secure
- Wrap infant entirely with sterile plastic wrap or place infant into sterile thermoregulation suit
 - Document use of thermoregulation suit and warming mattress, infant's temperature, and PIV placement/attempts in delivery attendance note
- Apply warmed hat on infant's head over plastic wrap (NOT with thermoregulation suit)
- MD/NNP to collect cord blood for culture, CBC, and ABO/Rh (type check)
 - ABO/Rh (type check) must have mother's identification sticker attached

Respiratory Management in the delivery room (DR) – in conjunction with NRP guidelines:

- **Bring warmed surfactant to the DR for ALL ELBW infants**
- Use T-piece resuscitator with initial settings: FiO₂ at 0.21, PIP 16 and PEEP +6 cm H₂O
- Intubation is to be performed by a proficient provider in the DR
- Provide PPV per NRP guidelines if initial intubation attempt is unsuccessful
- Secure ETT using minimal elastic tape applied over a thin layer of duoderm on the skin
- Confirm equal breath sounds bilaterally prior to administering surfactant
- Avoid suctioning if possible after surfactant administration
- Show infant to parents prior to transfer to the NCCC

DELIVERY ROOM MANAGEMENT OPTIONS	
Infants < 25 weeks gestation	IN and IN <ul style="list-style-type: none"> • Intubate and administer surfactant • Consider early extubation to bubble CPAP + 6 cm H₂O in the NCCC
Infants = 25 weeks gestation	<i>Consider risk factors and clinical presentation to choose DR plan from the options below:</i>
	IN and IN <ul style="list-style-type: none"> • Intubate for surfactant administration in DR with goal of early extubation to bubble CPAP + 6 cm H₂O in the NCCC
	IN and OUT <ul style="list-style-type: none"> • Intubate for surfactant administration in DR followed by extubation to mask CPAP +6 cm H₂O in DR
	Bubble CPAP <ul style="list-style-type: none"> • Begin mask CPAP +6 cm H₂O in DR • Consider early rescue surfactant in NCCC
Infants > 25 weeks gestation	Bubble CPAP <ul style="list-style-type: none"> • Begin mask CPAP +6 cm H₂O in DR • Consider early rescue surfactant in NCCC

INITIAL MANAGEMENT

On Admission to the NCCC:

- HUC to admit infant immediately
- Determine the risk for sepsis/need for sepsis evaluation based on the clinical status and circumstances leading to premature delivery
 - Determine whether or not cord blood collected for culture is sent to the lab
- Place STAT orders **FIRST**:
 - XR Neonate Umbilical Line Placement, antibiotics and admission labs:
 - CBC with differential, blood culture, and ABO/Rh (type check) **from cord blood**
 - Type and screen, POC blood gas and POC glucose **from central line**
- After signing STAT orders, complete the remainder of EPIC ELBW Admission Order Set
- Maintaining plastic wrap/thermoregulation suit, move immediately to pre-warmed isolette with top up and radiant heat on (transfer on/along with warming mattress)
- Weigh infant upon transfer to isolette and measure head circumference and length
- Take admission temperature and secure infant for line placement
- Start infusion of D10W via PIV at 60 mL/kg/hour
- Administer antibiotics (ampicillin first) via PIV (if blood culture obtained from cord blood)
- Connect CR leads and micro-preemie, non-adhesive pulse oximeter probe to monitors
- Ensure correctly sized face mask (standard preemie vs. micro preemie) is placed at the bedside for resuscitation
- Obtain initial vital signs via monitor. Auscultate heart and breath sounds. No cuff blood pressure monitoring unless unable to obtain arterial access.
- Insert and secure orogastric tube
- *Defer examination for red reflex until after the first 72 hours of life*
- Administer Vitamin K and erythromycin ointment (regardless of whether the eyes are fused)
- Keep infant on warming mattress during line placement (take radiograph for confirmation of line placement with infant on mattress)

RESPIRATORY SUPPORT

If BUBBLE CPAP:

- Use PEEP of at least +6 cm H₂O
- Consider early rescue surfactant if requiring increasing support
- For example, FiO₂ >0.3

If VENTILATED, refer to the [Initial Ventilation of ELBW Infant guidelines](#)

Blood gas goals: pH >7.25, PaO₂ 50-70 mmHg, PCO₂ 45-55 mmHg until patient can compensate for respiratory acidosis

- Order Vitamin A on admission ([Vitamin A Guidelines](#))
- Order caffeine loading and maintenance dosing on admission ([Caffeine Guidelines](#))
- Order prophylactic hydrocortisone on admission ([Prophylactic Hydrocortisone Guidelines](#))
- SpO2 goal: 91-95% (lower limit: 90%; upper limit: 96%), unless no supplemental oxygen
- Set bedside T-piece resuscitation oxygen concentration at no more than 10% above FiO2 requirement on ventilator or bubble CPAP
- DO NOT use Tcom because it is not reliable in this population and can burn the skin

UAC/UVC placement:

- On admission, STAT order placed including “XR Neonate Umbilical Line Placement”
- When provider is suturing the lines, RN to TEXT PAGE (919) 216-9233 “READY NOW for NCCC STAT XR Umbilical Line Placement”
- Experienced personnel should place umbilical lines (learner may scrub in to assist with the procedure); **remain sterile until central placement has been confirmed**
- Use 3.5 Fr single lumen catheters for umbilical lines (*consider 2.5 Fr **ONLY** for ELBWs that will not accommodate a 3.5 Fr catheter*)
- For infants < 750gm or < 25 weeks' GA, **consider dual-lumen UVC if:**
 - Unable to successfully place a UAC
 - Significant hemorrhage / abruption
 - Prolonged resuscitation
- For skin antisepsis use Betadine; allow 3-5 minutes for betadine to dry and then remove with warm sterile water prior to beginning the procedure
- Maintain plastic wrap/thermoregulation suit under sterile drapes
- AS SOON as blood return obtained, draw type and screen as well as POC blood gas and glucose (blood culture & CBC with differential if NOT obtained from cord)
- Administer antibiotics (ampicillin first) immediately after blood culture is obtained (via PIV)
- Once radiographic confirmation of lines obtained, secure lines and place infant on warmed memory foam positioning aide
- Isolette canopy cannot be closed until infant's temperature ≥ 36.4 degrees axillary.
- Initiate humidity per protocol immediately after procedures completed and isolette is closed
- Maintain plastic wrap/thermoregulation suit from the time of delivery until at least the subsequent “touch time”
- Consider leaving UAC in place for the first 72 hours to minimize need for multiple painful procedures and subsequent stress response

Initial Fluid and Nutritional Management:

- Initial fluid rate = 80mL/kg/day (briefly 60mL/kg/day via PIV until central access obtained)
- Do not use additional sodium
 - Do not infuse NaAcetate or NaCl via arterial line during the first 72 hours
 - Consider **single** bolus of LR rather than NaCl for hypotension (see [Hypotension Management](#))
- Use birth weight to calculate fluids until birth weight is regained
- Obtain the next weight on DOL #2 and then every 24 hours, per unit protocol
- Fluid management goal: expect 10-15% loss from birthweight with sodium < 155mg/dL

- Do not fluid overload (avoid weight gain > birthweight) in the first 14 days
- Do not exceed TF goal 150mL/kg/day in the first week (increased risk of NEC)
- If increases in TF indicated for sodium >155 consider increasing by no more than 10mL/kg/day
- Infuse isotonic amino acids 3.6% with 1 unit heparin/mL via UAC at 0.5mL/hr
- Infuse D10W with 2.5% AA and 0.5 unit heparin/mL via UVC (or PIV if unable to obtain UVC)
- Order TPN on the day of admission if possible
- Use D5W for flush solution and as base solution for medications initially
 - (CANNOT be used to heplock a PIV)
- Update the family:
 - Explain the importance of human milk and encourage early expression of colostrum/breast milk
 - Obtain verbal consent for use of donor breast milk (document consent in Epic; specify that risks and benefits of donor milk explained)
 - Obtain written consent for transfusion of blood products
- Provide [Oral Immune Therapy](#) with maternal colostrum Q6 hours at “touch times” as soon as it is available (regardless of NPO status)
- After verbal consent for human donor milk obtained, begin feedings per protocol with first 6 hour “touch time” unless contraindicated

ONGOING MANAGEMENT

Laboratory Evaluation Schedule for ELBW Infants (for the first 72 hours of life)		
Admission (STAT)	Daily 0800 (for 3 days)	Daily 2000 (for 3 days)
CBC and differential **		
	Neonatal Bilirubin	
	Chem 10	Sodium
Blood gas (POC) Glucose (POC) Blood culture ** Type and screen ABO/Rh (for type check) **		
<i>Monitor triglyceride levels every 48 hours for the first week of life.</i>		

**** CBC, blood culture and ABO/Rh should be obtained from cord blood whenever possible**

Assessment:

- Assess infant’s status and vital signs hourly via monitor and observation: use a “hands off” approach during these assessments
- Assess infant utilizing hands on care at “touch times” every 6 hours
 - Skin checks every 3 hours on bubble CPAP
- Providers will attempt to examine infants at the 6 hour “touch times” at 0800 (primary

providers) 1400, 2000 and 0200

Airway Management:

- Limit ETT suctioning to once per shift unless indicated for excessive secretions
- Do not routinely use normal saline for irrigating ETT prior to suctioning
- Use measured suction catheter with closed suction system
- Evaluate physiologic response (BP, HR, SpO2) to suctioning and the time to return to baseline. Do NOT routinely “pre- oxygenate” prior to suctioning.

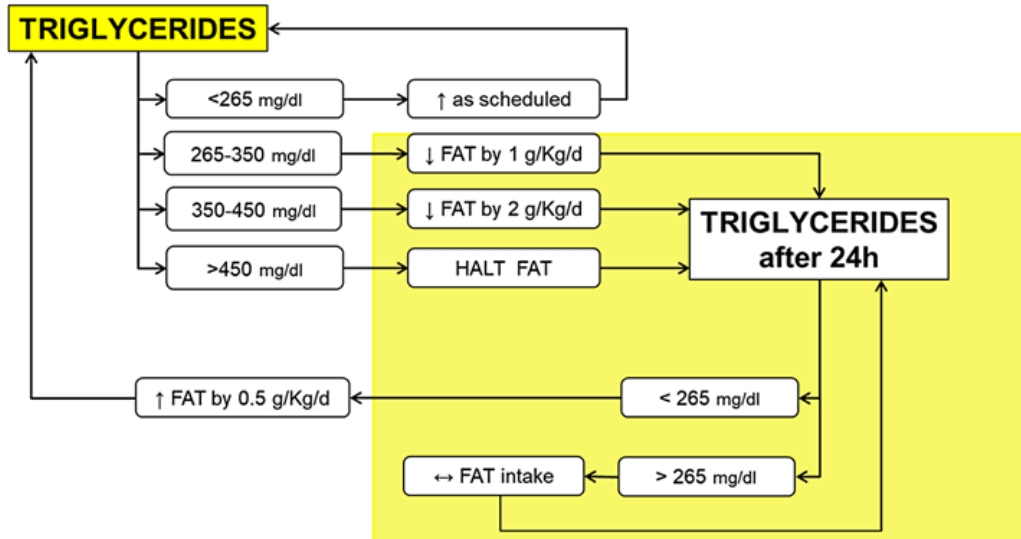
CONSIDER THE FOLLOWING CRITERIA FOR EARLY EXTUBATION (within the first 72 hours of life)	
pH > 7.3	Given greater pH is predictive of successful extubation
pCO2 < 55	Given goal range 45-55 within first 72 hours
FiO2 < 0.3	Given likelihood of surfactant administration if 0.3 or greater
<i>Avoid the use of ET-CPAP to determine readiness for extubation given minimal predictive value in assessment of extubation readiness</i>	

- If an infant on CPAP requires a second dose of surfactant, consider leaving the infant intubated long enough to adequately assess the response to the second dose of surfactant and the likelihood of a successful extubation with the goal of avoiding multiple intubations within the first 72 hours of life
- Intubation should be performed by a proficient provider for first 72 hours of life
[Initial Ventilation of ELBW Infant](#) & [Bubble CPAP Guidelines](#)

Fluid and Nutritional Management:

- Initiate feedings per protocol with first 6 hour “touch time” unless contraindicated
- Consider increasing lipid infusion by 0.5-1 gram/kg/day
- Monitor the triglyceride level Q48 hours for the first week
- Obtain a triglyceride level in the case of hyperglycemia >200mg/dL
- Consider use of 1:1 heparin in TPN and other fluids in the case of hypertriglyceridemia

[Nutrition Guidelines \(Parenteral and Enteral\) & Feeding Guidelines and Pathways](#)



Triglyceride monitoring and intravenous lipid titration protocol. Carnielle et al., 2021

Handling:

- Implement developmentally supportive care with the goal of limiting hands on care to “touch times” every 6 hours (understanding that infants on bubble CPAP require checking of pressure points every 3 hours)
- Keep noise to a minimum (i.e., conduct rounds and discussions away from the bedside)
- Place a blanket/cloth cover over the incubator to minimize light exposure (may open a corner to visualize infant)
- Never place items on top of the incubator
- Appropriately warm all items that will touch the baby such as the stethoscope, diaper, etc.
- Wash hands (preferred over alcohol cleansers) before/after touching the infant
- Wear gloves
- Defer initial bath until after the first 72 hours and clinically stable

Positioning:

- Maintain plastic wrap/thermoregulation suit from the time of delivery until at least the subsequent “touch time”
- If infant’s temperature remains stable (>36.4 degrees C) at the first “touch time”, plastic wrap/thermoregulation suit may be removed
- If infant becomes hypothermic during the first 72 hours of life and there is difficulty increasing temperature back to a eutermic range, consider placing infant in plastic wrap/thermoregulation suit
- Nest all babies for at least the first 72 hours on a warm memory foam positioning aide with head in midline position, arms/legs in flexed position, HOB elevated to 30 degrees
- For the first 72 hours, radiographs should be taken without removing the memory foam positioning aid
- After the first 72 hours the memory foam positioning aid should be removed for radiographs unless the provider determines the patient is too unstable to move.

- Reposition every 6 hours
- After the first 72 hours and when infant is stable enough to tolerate it, begin to alternate positioning to side lying with foot and back support or position prone without neck roll

Additional Considerations:

- ELBW infants are at increased risk for early hypotension; refer to the following guidelines:
 - [Treatment of Hypotension for Extremely Low Birth Weight Infants](#)
 - [Hydrocortisone Stress Dosing](#)
- Avoid use of indomethacin during treatment with either prophylactic or stress dose steroids and for minimum 48 hours post-treatment
- ELBW infants are at high risk for hyperglycemia. Consider multiple insulin doses prior to initiation of continuous infusion as the small volume and low rate of the infusion results in a long delay in reaching steady state.
- All ELBW infants will meet criteria for intraventricular hemorrhage ([IVH](#)) and retinopathy of prematurity ([ROP](#)) screening

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