

Newborn Critical Care Center (NCCC) Clinical Guidelines

Initial Management of Extremely Low Birthweight (ELBW) Infants

QUALIFICATIONS: Neonates < 28 weeks of 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)

One experienced RT

Team members will attend delivery and directly participate in the delivery room and admission care

When available, a designated team scribe should also be assigned to document timing and key steps of the resuscitation.

See [ELBW Golden Hour Provider Role Assignments](#) for details.

Set-up in NCCC prior to delivery:

- 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
- D10W with 2.5% amino acid solution and 0.5 units/1 mL heparin primed through IV tubing with medline, ready to start
- 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

Set-up in DR prior to delivery:

- Preheated isolette
- Turn the thermostat in the room up to at least 74° Fahrenheit
- RT to pre-warm surfactant, set up CPAP, duoderm, and elastic tape for securing ETT
- Provider to prepare the laryngoscope and ETT
- **Use T-piece resuscitator with initial settings: FiO2 at 0.3, PIP 20, and PEEP +5 cm H₂O**
- Ensure both the standard preemie and micro-preemie face masks are available
- Open the temperature probe cover and cut it in half. Prepare a thin piece of Duoderm to place on the infant's skin beneath the 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)
- Leader to provide OB team with sterile thermoregulation suit (raincoat)

At Delivery:

- **Delay cord clamping for 60 seconds with OB provider gently stimulating infant while placing them in sterile thermoregulation suit – if NOT responsive, proceed to resuscitation**
- Apply a half gold heart temperature probe over a thin layer of Duoderm on the skin and switch the radiant heat warmer to infant temperature control
- Apply a micro-preemie, non-adhesive pulse oximeter probe and micro-preemie CR leads

Delivery Respiratory Management (NRP 9th edition)

General Principles

- **Routine or automatic intubation in the DR is not recommended for neonates of any gestational age**
- ELBW infants with spontaneous respiratory effort should remain on **mask CPAP** and be transferred to the unit for further stabilization
- Have **warmed surfactant available in the DR for early administration** for all ELBW infants who are intubated in DR with $FiO_2 > 0.3$
- Administer surfactant in the unit if **$FiO_2 > 0.3$**
 - Surfactant administration should be guided solely by the infant's FiO_2 requirement and not by peak inspiratory pressure (PIP)

Initial Respiratory Support

- Use **T-piece resuscitator** with: PIP 20cm H₂O, PEEP 5 cm H₂O FiO_2 0.3

Criteria for Intubation (per NRP)

- Apnea
- Ineffective ventilation
- Inadequate heart rate response
- Intubation should be performed **only by an experienced provider**

If Intubation Is Required in the DR

- Intubation should be performed by a **proficient provider**
- If the first attempt is unsuccessful, resume PPV following NRP guidelines
- Secure ETT with **minimal elastic tape** over a thin layer of Duoderm
- Confirm **equal bilateral breath sounds** before administering surfactant
- Avoid suctioning for at least 30-60 minutes after surfactant unless absolutely necessary

Recommended ETT size based on weight and GA		
Weight (g)	GA (weeks)	ETT size
<500		2.0
500-799	22-25	2.0 or 2.5 based on provider judgement
800-1200	26-28	2.5

After Respiratory Stabilization

- Remove the cord lock from the hood of the thermoregulation suit (raincoat) and apply a warmed hat on the infant's head overtop the plastic
- Place PIV (limit to one attempt) using gentle, low-adhesive, blue tape to secure
 - Document use of thermoregulation suit and warming mattress, infant's temperature, and PIV placement/attempts in the delivery attendance note
- Weigh the patient before leaving the DR using 'weigh/weigh' procedure on isolette
- Keep the isolette top up / maintain in radiant warmer mode during transfer (unless in the main OR) to minimize temperature fluctuations
- Provide parents with an opportunity to see their infant before transfer to the NCCC.

INITIAL MANAGEMENT

On Admission to the NCCC:

- HUC to admit the infant immediately
- Determine the risk for sepsis/need for sepsis evaluation based on the clinical status and circumstances leading to premature delivery
- 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 the central line**
- After signing STAT orders, complete the remainder of the EPIC ELBW Admission Order Set
- Maintain infant in plastic wrap/thermoregulation suit (until the first "touch time" AND temperature >36.4)
- Place memory foam positioning aide at the bottom of the isolette to allow it to warm during line placement
- Measure the head circumference and length
- Take the admission temperature and administer vitamin K before securing the infant for line placement
- Start infusion of D10W via PIV at 60 mL/kg/hour
- Administer antibiotics, when indicated, (ampicillin first) via PIV (if blood culture obtained from cord blood)
- Connect CR leads and the micro-preemie, non-adhesive pulse oximeter probe to the monitors
- Ensure a 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 the orogastric tube
- *Defer examination for red reflex until after the first 72 hours (all infants qualify for ROP exams)*
- Administer erythromycin ointment (regardless of whether the eyes are fused)
- Keep the infant on a warming mattress during line placement (take a radiograph for confirmation of line placement with the infant on the mattress)

RESPIRATORY SUPPORT

If BUBBLE CPAP:

- Use PEEP of at least +6 cm H₂O
- Consider early rescue surfactant if requiring FiO₂ > 0.3
- PIP or pressure requirements should not be used as criteria for surfactant administration

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

Blood gas goals: pH >7.25, PCO₂ 50-60 mmHg until the 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 VOCERA Radiology “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 ELBW 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
- 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 (via PIV), when indicated, (ampicillin first) immediately after blood culture is obtained
- 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”
- UAC to remain in place for first 72 hours to minimize painful procedures / 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 at the following 0200 touch time regardless of time of admission and then every 24 hours, per unit protocol
- Infuse isotonic amino acids 3.6% with 1 unit heparin/mL via UAC at 0.3-0.5mL/hr
- Infuse D10W with 2.5% AA and 0.5 unit heparin/mL via UVC (or UAC/PIV if unable to obtain UVC)
- Infuse intralipid at 0.5 gram/kg/day along with D10W with 2.5% AA
- 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 heparin lock a PIV)
- Update the family:
 - Explain the importance of human milk and encourage early expression of colostrum/breast milk
 - Obtain verbal assent for use of donor breast milk (document 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 assent 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 **	iCa (if obtaining blood gas)	
	Neonatal Bilirubin	
	Chem 10	Sodium
Blood gas (POC) Glucose (POC) Blood culture ** Type and screen ABO/Rh (for type check) **		
Monitor triglyceride levels per nutritional guidelines		

**** 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.
- Intubation should be performed by a proficient provider for first 72 hours of life and preferably using the video laryngoscope (i.e NeoView)

CONSIDER THE FOLLOWING CRITERIA FOR EARLY EXTUBATION (within the first 72 hours of life)	
pH > 7.2	Given greater pH is predictive of successful extubation
pCO₂ < 60	Given goal range 50-60 within first 72 hours
FiO₂ < 0.3	Given likelihood of surfactant administration
<i>Avoid the use of ET-CPAP to determine readiness for extubation given minimal predictive value in assessment of extubation readiness</i>	

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[Initial Ventilation of ELBW Infant & Bubble CPAP Guidelines](#)