

Table 1. Smart Start protocol for delivery room management of the preterm very low-birth-weight infant^a

Time	Clinician					
	MD/NNP 1	MD/NNP 2	RN 1	RN 2	RT 1	RT 2
Before delivery	1) Predelivery planning and preparation					
	Discusses care with OB team • Steroids • Magnesium • Antibiotics • Placenta to Pathology • Cord gases	Prepares lines	Prepares delivery room warming supplies (polyethylene wrap [NeoWrap [®]], chemical warmer)	Sets up warmer/ isolette (Giraffe) in NICU (prewarmed)	Prepares intubation supplies (ET tube, laryngoscope, CO ₂ detector)	Sets up ventilator/ bubble CPAP in NICU
	Performs prenatal consult (including parental preferences for resuscitation)	Completes initial orders (IV fluids, chest x-ray, etc)	Prewarms resuscitation bed and environment	Prepares IV fluids, laboratory supplies, and surfactant supplies (gavage tube, ET tube adapter)	Sets up oxygen blender in delivery room at 30%	
	Initiates cord clamping protocol with OB team (1 minute recommended)	Orders surfactant	Immediately before delivery, activates chemical warmer	Prepares resuscitation record	Prepares T-piece (PIP = 18 cm H ₂ O, PEEP = 5 cm H ₂ O, Gas Flow = 8 L/minute)	
	Reviews care plan and roles with team	Collects pertinent health history		Obtains surfactant (Pyxis [®])		
Birth to 1 minute	2) Delivery room resuscitation and stabilization: initial resuscitation					
	Starts video recorder	Receives infant from OB team	Wraps infant in NeoWrap without drying infant and applies hat	Starts Apgar timer	Assesses for spontaneous respirations	
	Directs resuscitation	Assesses infant HR and respirations	Places skin temperature probe	Places pulse oximeter on right hand (preductal) and turns on machine		
Breathing and HR > 100/minute	Continues monitoring	Continues monitoring			Ensures adequate seal for mask CPAP	
Apneic or HR > 100/minute	Monitors for response to PPV	Assesses for chest rise and HR		Prepares intubation supplies	T-piece ventilates with mask (PIP = 18 cm H ₂ O, PEEP = 5 cm H ₂ O RR= 40-60/minute) • May need higher PIP initially but <i>avoid excessive chest rise</i> • Use ETCO ₂ detector to monitor adequacy of bagging	
1 to 5 minutes	2) Delivery room resuscitation and stabilization: continued resuscitation					
Breathing and HR > 100/minute	Continues monitoring	Continues monitoring	Measures initial temperature	Monitors SaO ₂	Ensures adequate seal for mask CPAP	
	Monitors SaO ₂ and directs adjustment of FiO ₂ (per age-based SaO ₂ nomogram)				Adjust FiO ₂ to maintain per age-based SaO ₂ nomogram Monitors for appropriate CPAP (PEEP = 5 cm H ₂ O)	
Apneic or HR < 100/minute	Monitors for duration of intubation	Intubates infant • ET tube size: < 1 kg = 2.5 mm 1 to 2 kg = 3.0 mm • Insertion depth = Infant weight + 6 cm at lip • Blue line to the <i>left</i>	Measures initial temperature and monitors for ongoing thermoneutrality	Assists with intubation and securing of ET tube • Blue line to the <i>left</i>	Assesses appropriate placement with increasing HR, ETCO ₂ , and bilateral breath sounds	
	Monitors SaO ₂ and response to resuscitation for FiO ₂ adjustments	Assesses appropriate placement with increasing HR, ETCO ₂ , and bilateral breath sounds			T-piece ventilates via ETT (PIP = 18 cm H ₂ O, PEEP = 5 cm H ₂ O, RR = 40-60/minute) May need higher PIP initially but <i>avoid excessive chest rise</i>	
	Monitors for appropriate ventilation via chest rise and ETCO ₂ detector	If HR < 60/minute despite adequate ventilation, prepares for UVC placement	If HR < 60/minute despite adequate ventilation, calls for backup and draws up epinephrine dose	If HR < 60/minute despite adequate ventilation, initiates chest compressions	Monitor for appropriate ventilation with chest rise	
	Directs further resuscitation as needed per NRP	Performs further resuscitation as needed per NRP	Performs further resuscitation as needed per NRP	Performs further resuscitation as needed per NRP	Performs further resuscitation as needed per NRP	
5 to 20 minutes	3) NICU admission and stabilization: transport to NICU					
	Determines stability for transport to NICU	Assigns Apgar score	Continues to monitor temperature every 5 minutes	Assists with transport back to NICU	Ensures adequate mask CPAP or ventilation with T-piece	Finalizes bubble nasal CPAP or ventilator setup

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	If infant is intubated, considers early rescue surfactant (<i>strongly considers</i> if $FiO_2 > 40\%$ and/or $Paw > 8$ cm H_2O)	Readies and administers early rescue surfactant per neonatologist		Weighs and measures infant Transfers infant to Giraffe warmer/isolette	Assists with early rescue surfactant administration per neonatologist	
20 to 30 minutes	3) NICU admission and stabilization: initial NICU stabilization					
	Assigns initial ventilator settings (if needed): PIP sufficient for VT of 4 to 6 mL/kg, PEEP of 5 cm H_2O , rate of 40, IT of 0.35 seconds, and FiO_2 to maintain SaO_2 at 85% to 92%	Places appropriate lines (UAC, UVC, PAL, PIV) • PIV should be <i>strongly considered</i> as first line to allow stabilization of infant and rapid IV glucose initiation	Monitors for ongoing thermoneutrality	Prepares infant for line placement and assists with equipment setup	Checks for appropriate ventilator settings or nasal CPAP: PIP sufficient for VT of 4 to 6 mL/kg, PEEP of 5 cm H_2O , rate of 40, IT of 0.35, and FiO_2 to maintain SaO_2 at 85% to 92%	
	Updates parents	Draws blood for stat blood gas analyses	Places transcutaneous CO_2 monitor	Sends initial laboratory test specimens stat	Documents VT every 10 minutes (for first hour)	
			Places orogastric tube if intubated or receiving nasal CPAP	Gives first dose of antibiotics <i>if ordered</i>	Runs initial blood gas and cord blood gases	
	Monitors BP/perfusion • Limit fluid boluses and consider vasopressors if > 20 mL/kg needed		Notifies x-ray technician of need for x-ray	Starts arterial line fluid and transduces BP		
30 to 60 minutes	3) NICU admissions and stabilization: transition to ongoing NICU care					
	Assesses initial chest x-ray for lung expansion and ET tube and line placement and discusses with team	Finalizes admission orders	Monitors for ongoing thermoneutrality	Assists with ET tube adjustment • Blue line to the <i>left</i>	Assists with ET tube adjustment • Blue line to the <i>left</i>	
	Monitors for appropriate ventilator settings or nasal CPAP	Completes physical examination	Administers admission medications	Starts UVC fluid with confirmed line placement	Monitors for appropriate ventilator settings or nasal CPAP	
	Assesses initial arterial blood gas, with targets of: • pH = 7.25 to 7.35 • $pO_2 = 40$ to 60 mm Hg • $pCO_2 = 45$ to 60 mm Hg				Documents VT every 10 minutes (for first hour)	
Appropriate blood gas levels and $FiO_2 < 40\%$	Continues NICU care	Continues NICU care	Continues NICU care	Continues NICU care	Continues NICU care	Continues NICU care
Hypercapnia or hypoxemia on ventilator	Decides ventilator adjustments				Adjusts ventilator per MD orders	
	If $FiO_2 > 40\%$ or $Paw > 8$ cm H_2O , <i>strongly considers</i> early rescue surfactant if not already given					
Apnea, hypercapnia, or hypoxemia ($FiO_2 > 40\%$) on bubble nasal CPAP	Monitors for duration of intubation	Intubates infant • ET tube size: < 1 kg = 2.5 mm 1 to 2 kg = 3.0 mm • Insertion depth: Infant weight + 6 cm at lip • Blue line to the <i>left</i>	Monitors for ongoing thermoneutrality	Assists with intubation and securing of ETT • Blue line to the <i>left</i>	Assesses appropriate placement with increasing HR, $ETCO_2$, and bilateral breath sounds	
	Assigns initial ventilator settings: PIP sufficient for VT of 4 to 6 mL/kg, PEEP of 5 cm H_2O , RR of 40/minute, IT of 0.35 seconds, and FiO_2 to maintain SaO_2 at 85% to 92%	Orders x-ray	Notifies x-ray technician of need for x-ray	Sends repeated direct arterial blood gas samples within 1 hour	Checks for appropriate ventilator settings: PIP sufficient for VT 4 to 6 of mL/kg, PEEP of 5 cm H_2O , RR of 40/minute, IT of 0.35, and FiO_2 to maintain SaO_2 at 85% to 92%	
	If $FiO_2 > 40\%$ or $Paw > 8$ cm H_2O , <i>strongly considers</i> early rescue surfactant	Readies and administers early rescue surfactant per neonatologist			Assists with early rescue surfactant administration per neonatologist	
					Documents VT every 10 minutes (for first hour)	

^a Gestational age less than 33 weeks and/or body weight less than 1500 g.

^b NeoWrap, Fisher & Paykel Healthcare, Irvine, CA; Giraffe OmniBed, GE Healthcare, Chalfont St Giles, UK; Pyxis, CareFusion Corp, San Diego, CA.

BP = blood pressure; CO_2 = carbon dioxide; CPAP = continuous positive airway pressure; FiO_2 = fraction of inspired oxygen; ET = endotracheal; $ETCO_2$ = end-tidal carbon dioxide; HR = heart rate; IT = inspiratory time; IV = intravenous; MD = physician; NNP = neonatal nurse practitioner; NICU = neonatal intensive care unit; NRP = Neonatal Resuscitation Program; O_2 = oxygen; OB = obstetrics; Paw = mean airway pressure; PAL = peripheral arterial line; pCO_2 = partial pressure of carbon dioxide; PEEP = positive end-expiratory pressure; PIP = peak inspiratory pressure; PIV = peripheral intravenous line; pO_2 = partial pressure of oxygen; PPV = positive pressure ventilation; RN = registered nurse; RT = respiratory therapist; SaO_2 = arterial oxygen saturation; UAC = umbilical arterial catheter; UVC = umbilical vein catheter; VT = tidal volume.