

NICU Routines

WELCOME TO THE NICU!

Prior to entering the entering the NICU

- ❑ Remove of all hand jewelry and bracelets prior to entering the NICU. (if you are unable to do so, you need to contact the NICU manager)
- ❑ No color nail polish

Prior to entering the patient bed space

- ❑ Use AVAGARD (waterless, brushless scrub) at the beginning of your shift. Remember to apply to clean, dry Hands. Avagard stations are located at each bed spot.

DOCUMENTATION

NICU-specific Flow Sheets – make sure to change your EPIC flow sheet to NICU – appropriate rows will populate

- ❑ Assessment NICU
- ❑ NICU Daily Care
- ❑ NICU vital signs
- ❑ Neonatal Cart sheet (wrench via patient summary, print q Sunday night shift and put in bedside chart)

DAILY ROUTINE

Use cover gowns appropriately:

- ❑ For patients on isolation – use a new gown with each patient contact
- ❑ For non-isolation patients – wear a gown when holding the baby (may use same gown for same baby during the shift)
- ❑ Long sleeve clothing must be pulled up above your elbows when performing any type of care

Frequency of Vitals & Assessments

- ❑ Vitals from monitor every 1 hour
 - Any patient with a vasoactive drip infusing
 - Any patient experiencing respiratory or cardiac instability (even if it's temporary)
- ❑ Hands on assessments q 4 hours for any 1:1 patient
- ❑ Vitals and assessments every 3 hours for any patient requiring q 3 hour feeds
- ❑ Vitals and assessments every 4 hours
 - For all NPO patients
 - For feeder growers on demand feeds with a max of 4 hours
- ❑ Temperature
 - **All patients=axillary temps only (no rectal temps)** with hands on assessments or prior to feeds.
 - Any patient less than 36.5 degree Celsius:
 1. Do not be fed. Reassess temp.
 2. If temp is still < 36.5, attempt to re-warm and contact medical team

- ❑ Skin condition score=with every Hands on Assessment
- ❑ Assessments also include double-checking equipment settings (i.e. ventilator, chest tubes etc)
- ❑ IV sites and any pumps are checked hourly

Pain Assessments

- ❑ NPASS with every assessment

Labs

- ❑ Call respiratory prior to drawing ABGs

Daily Care

- ❑ Baths are PRN
- ❑ Trach changes weekly
- ❑ Trach ties are q shift
- ❑ Weight q night shift
- ❑ Length and head circumference q Sunday night shift
- ❑ PCVC dressing changes are PRN. If a dressing is loose, notify the charge nurse
- ❑ Central line dressing changes every Sunday on the day shift (you must use another NICU nurse as a resource)

Miscellaneous

- ❑ For circumcisions or car seat testing ask charge nurse to assign a resource nurse to assist
- ❑ Tube station = Code 1 1 1 1 number 809

NICU Routines

NUTRITION

Breast milk location

- ❑ Every 2 bed spots share a refrigerator
- ❑ Freezers for breast milk storage are located in the procedure room on the 2nd floor and at the nurses station in the TCU

Breast milk storage and use (1450G Policy)

- ❑ Fresh breast milk that has never been refrigerated may be kept at infant's bedside at room temperature for no more than 4 hours (discard if not refrigerated or administered within 4 hours)
- ❑ Fresh breast milk that has never been frozen may be stored up to 96 hours at refrigerator temperature
- ❑ Frozen breast milk should be used in the order it was expressed (oldest expressed dated should be used first)
- ❑ Thawed breast milk that has not been warmed must be used within 24 hours of thawing or be discarded
- ❑ Breast milk which has been fortified and refrigerated should be used within 24 hours of fortification or discarded.

Formula storage

- ❑ Formulas prepared by formulary nutrition should all be refrigerated and are good for 24 hours

Formula/Breast milk administration

- ❑ Continuous NG feeds: Change tubing & syringe Q4 hrs for breast milk & formula
- ❑ All formulas/breast milk syringes must be labeled indicating the appropriate contents of the syringe
- ❑ When using a syringe pump to administer breast milk via NG, the syringe pump should be upright (vertical) with the plunger towards the floor to enhance breast milk fat delivery

UNIT RESOURCES

References: NICU Practice guidelines above the charge nurse desk

- ❑ Charge RN
- ❑ Code RN
- ❑ Unit Educator: Carrie Smith-Hosman

Unit Managers: Alicia Gamboa, Christina Billy, Kim Gonzalez

Unit Director: Brandi Parker

- ❑ Unit Clinical Pharmacist Pooja Shah
- ❑ Social work: Amy Morris

NICU Routines

ASSIGNMENT TYPE

Patient Types:

- Feeders/growers
- Stable intubated patients
- ECMO patients (when planned out between NICU and PICU nurses/managers)
- No more than a 3-patient assignment will be given (NICU or TCU)
- 1:1, discuss with management team

Preferred Assignments:

- 2 intubated babies
- 2 trach/vent

Devices to Avoid:

- They can take umbilical lines, but remember they have limited experience with care and maintenance (an experienced resource is needed for this assignment)
- Giraffe Beds (PICU nurses do not have experience with these beds)

Assignment to avoid:

- Admissions or Discharges requiring NICU-specific education
- Code assignment
- Patients needing to go on outside transport
- Patient on whole body cooling (Hypoxic Ischemic Encephalopathy)
- No patients less than 1600 grams

A resource buddy will be assigned to the float RN as a resource

EMERGENCIES

TCU

- All monitor alarms go directly to assigned RN phone
- For a code: hit blue “code” button on wall at head of bed. Neonatal code blue team will respond plus all RN phones in TCU will ring.

ICU

- Monitor alarms do NOT connect to assigned RN phone
- Two nurses must be present per pod at all times
- For a code: hit blue “code” button on wall at head of bed. Neonatal code blue team will respond plus all RN phones in ICU will ring.

MTCU (Mitchell Room 5)

- Monitor alarms do NOT connect to assigned RN phone
- Two nurses must be present in room at all times
- For a code: dial **1-5-9** and state location and neonatal emergency. Neonatal code blue team will respond.

Patient off of unit:

- For a code: dial **1-5-9** and state location and neonatal emergency. Neonatal code blue team will respond.

CICN, CTCU, MTCU Tour

CICU/2nd Floor

- Soiled utility/timeclock: show specialized linen basket
- Show main hallway monitors and strip printer (point out both ends)
- Pumping room
- Lab label printer
- Paperwork drawer
- Drawer where extra IV pumps and kangaroo pumps stored
- Tube station and code to open
- Isolation signs
- Patient label books
- Point out where assignment are hung
- Supply room: explain layout
- Breast milk freezer
- Procedure room: show where extra suction and monitor modules are stored
- Staff washroom
- Point out where charge and code sit
- Linen cart
- Evacuation sled
- Show central unit hallway: Omnicells, supply cabinets, IV labels, small transport bags, syringe pumps, feeding pumps, O2 tanks, Chest Tube bins, scales, heat lamps, transilluminators, and crash carts.
- Lab supply drawer
- Supply drawers: both sides
- Dexi meters
- Where to find assignment sheets in pods
- Show donor milk refrigerator
- Off unit equipment rooms
- Locker room
- Time clock
- Breakroom/time clock

CTCU

- Where to badge onto unit

- Where charts are kept, point out that cart sheet in chart and updated Mondays after dosing weight updated
- Tube station
- Where assignment sheets are to be found
- Lab label printer
- Medication room, Omnicell, breast milk freezer, IV labels, Dexi meter
- Soiled utility room/food tray drop off
- Time clock
- Linen cart
- Where scales, heat lamps, Eddy's, and extra equipment kept
- Staff washroom East
- Clean utility room, explain layout
- Staff washroom West
- Breakroom
- Point out K416/palliative care room
- Show alcove with crash cart, radiant warmer, and evacuation sled
- Show alcove drawers
- Point out private rooms on the East and double rooms on the West
- Show a room: point out breast milk refrigerator

L & D

- Where it is
- Point out small baby giraffe and stork towers
- Point out ante rooms
- Bouffant, mask, and shoe cover area
- 2 ORs and small baby giraffes (show if able)
- Alcove with crash cart, shuttle, and transports
- LDR intubation box cabinet
- Point out LDR hallway
- Triage hallway
- Triage crash cart
- Show room if able

MTCU

- On way can point out Panera
- Show stairwell and elevator to access

- Tube station
- Staff washroom
- Crash cart
- Breakroom
- Omnicell
- Sharps/IV/lab cart and code
- Show supply area
- Linen cart
- Lab label printer
- Chart and label area
- Time clock

Intubation:

MDs/NNPs, fellows, and residents are able to perform intubations in the NICU/CTCU/MTCU. If the need for intubation was not planned, you may not be able to leave the bedside to obtain supplies if you need to hand-ventilate the infant with the bag and mask. In this case, ask one of your co-workers to get a doctor or NNP, grab the intubation kit or “box” (located in the alcoves between pods) , and to “cut tapes” for you. If no one is readily available, hit your Code Blue or Staff Assist button found on the wall of each bed space. (Ideally you will already have pre-cut tapes at the infant’s bedside).

Intubation Kit Contents:

Two stylets

One of each size blades (00, 0, 1)

Three each ETT size (2.5, 3, 3.5, 4)

Two benzoin

One pediacap (CO2 detector)

Three light bulbs

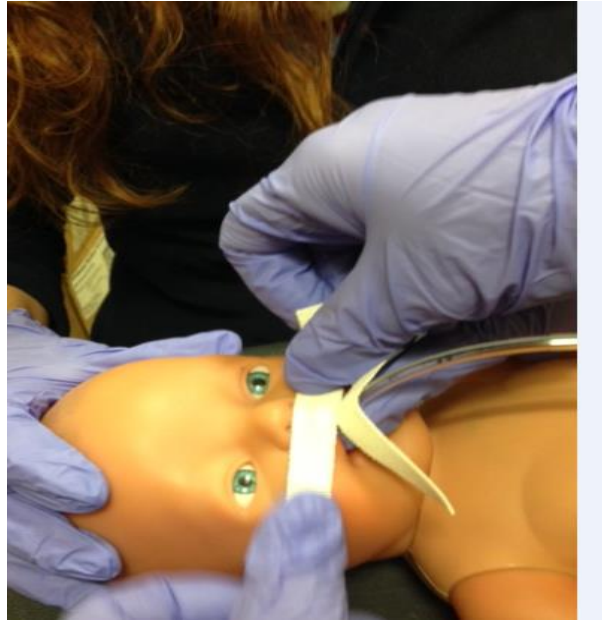
One pkg double “AA” batteries

Securing the ETT

- Place Duoderm[®] under the tapes. We cut the Elastoplast[®] tape into 3 strips: one “H” and two “Y’s.”



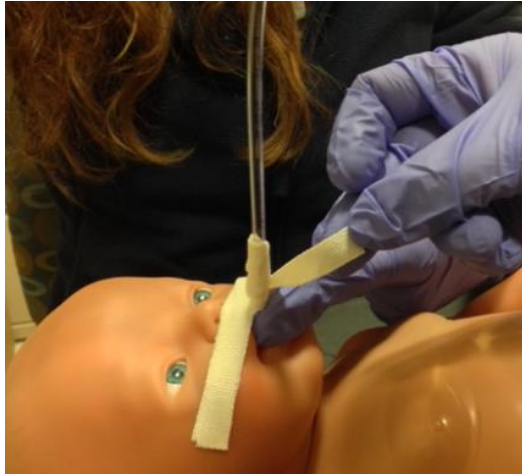
- The “H” is placed with the top strip over the infant’s upper lip, stretched out fairly tight directly across the cheeks.



- The bottom strip will then have half of itself hanging over each side of the tube. Wrap one side of the strip over and around the ETT, angling each wrap slightly downward as you go



- Next wrap the other side in the same manner. Take one of the “Y’s” and place the uncut side on one side of the face, on top of the “H” already placed on the cheek. The top strip of the “Y” will be stretched over the lip and over onto the opposite cheek (again, on top of the tape that is already there from the “H”).



- The bottom strip of the “Y” is to be wrapped under and around the ETT in the same downward spiral as the “H” was. Do the same with the remaining “Y”, only start on the opposite cheek as the first “Y”.



After the tube is taped in place, make sure the secretary orders a stat chest X-ray for your infant.

Frequency of Vitals & Assessments

Our routine for full vital signs and full hands-on assessments for each baby is prior to each bolus feeding (every 3 hrs), and every 4 hrs if the infant is NPO or on continuous NG feedings. We encourage minimal handling between assessments, to allow the babies to have uninterrupted rest periods. Try to group any blood draws or other procedures (baths, weights, suctioning, dressing changes, IV starts, etc.) around the feedings or the hands-on assessments, so that the infants are not being awakened in between their assessments. Monitor vitals (HR & B/P) are to be taken every hour on any infant on cardiac or blood pressure drips, or who is unstable. Full hands-on assessments are usually done every 4 hours on these unstable patients but may be moved to every 6 hours if the infant does not tolerate handling well (you must get a written order for it from the NNP's, the fellow, or the attending). On the fourth floor, B/P's may be done every other assessment. You can often plan your day based upon what time your babies are "due", i.e. are they on a 9-12-3-6 schedule, or an 8-12-4? We generally avoid scheduling feedings or assessments for 7AM or 7PM (for example, you will not see any 10-1-4-7 feeding schedules).



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Comer NICU Orientation

Orientation Class

- Introduce the fundamental knowledge needed to make your orientation a success
- 3 days total, 4-6 hours long
 - » Day 1-Before starting on the unit
 - » Day 2-Before starting on second floor (or within first few weeks)
 - » Day 3-Before you go to nights

Orientation Class Days 1, 2, and 3

Day 1

- » Head to toe assessment/Epic
- » Tour of Units
- » Safety Checks
- » Report
- » Pumps
- » Easy TF
- » Scavenger Hunt
- » Equipment
- » Chain of Command
- » Communication with parents
- » All thing Boobies (condensed)
- » Medication Administration
- » A/B/D and how to handle them
- » Radiant warmer/servo control/air control

Day 2

- » I/O calculation
- » Complex TF
- » GTTs (pain/sedation)
- » Easy Line Changes
- » Blood Transfusions
 - » One liner about exchange transfusions
- » Respiratory: CPAP, Conventional Vent, NAVA
- » Blood Draws/IV starts
- » Septic Workup
- » Developmental Care
- » Intubations/Cutting Tapes
- » RSI
- » Medication Review calculating dosages and volumes for one-times (Fentanyl/Ativan/D10W/Cis)
- » Q&A

• Day 3

- » Safety Scenarios- what to do when the infant decompensates
- » Hard Line changes
- » GTTs- pressers
- » Chest Tubes/Needle Aspiration
- » Respiratory: Oscillators, iNO, Flolan
- » Fluid Warmer
- » Cooling/Neuro (cooling blanket, NIRS)
- » How to set up an admission bed for a admit/sick admit

Orientation Class

- » Brief overview and tour of the CICN/CTCU/MTCU, all of which comprise Comer NICU
- » Learn about your role and responsibilities as a NICU nurse
- » Review nursing resources
- » Review NICU safety practices
- » Learn a thorough head to toe assessment of an infant
- » Review commonly used equipment in the NICU



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Introductions

Tell us: experience, new grad, NICU experience, baby experience?

Orientation Class

- Unit orientation is generally 12 weeks in length and is split between day and night shift
- You will be paired with preceptors for both shifts and will follow their schedules
- There is a pathway that will guide your orientation
 - » your first clinical days will be in the CTCU

Orientation Class

- Example of Orientation Pathway

	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7
Dates	4/23/23 – 4/29/23	4/30/23 - 5/6/23	5/7/23 – 5/13/23	5/14/23 – 5/20/23	5/21/23 – 5/27/23	5/28/23 – 6/3/23
Typical Days	1,2,3 4 th	4,5,6 4 th	7,8,9 2 nd	10,11,12 2 nd	13,14,15 2 nd	16,MDH,17 2 nd
Typical Patients	3 Typical TCU patients	3 Typical TCU patients	Stable NICU patients	More Complex Patients	Stable Micro Premie	Stable Micro Premie/ Unstable NICU Patients
Orientation Focus	Familiarize with Unit resources & Epic Road Trips & D/C's	Time Management & Autonomy Family Teaching	Time Management & Autonomy HFNC, CPAP	NCPAP or Low Vent 1 or 2 drips	Moderate vent Lines and 1 or 2 drips	Moderate Vent Lines
Orientation Sessions	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.
Orientation Sessions given	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.


Orientation Class

- Intensive Care Unit Nursing Orientation Skills Validation Checklist
 - » This list must be completed and turned in to management for you to complete orientation and receive self scheduling access
 - » Make sure you keep track of this list
 - » Kindly remind your preceptors to fill it out during your orientation
 - » Make a copy for your own personal records before turning in

Orientation

- Example of Skills Checklist

1



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Neonatal Intensive Care Unit Nursing Orientation Skills Validation Checklist FY23 – Core III/IV

Name: _____	VALIDATION METHOD KEY: C – Online Module Completion CS – Case Study/Discussion Group D – Demonstration/Return Demonstration DR – Discussion/Reflection Group M – Mock Event/Simulation O – Observation of Daily Work PR – Peer Review S – Self-Assessment T – Test or Post-test
Unit: NICU	
Date: _____	

Core III Skills

Performance Criteria: Core III General Skills and Knowledge	Date(s)	Validator Initials	Validation Method	Comments
Review the following Patient Care Policies: 1. A08-37 Code Pink: Infant/Child/Adolescent Security 2. Comer Children's Hospital Visiting Policy				
Medication Calculation Test (88% to pass)				
Patient privacy and confidentiality – review Policy HR 608				
Patient Identification – review A08-19				
Ability to seek information/identify resources: • Accessing policies • UCM Formulary • Micromedex/Lexi-comp/Compatibility Charts • UpToDate • Elsevier Skills • Unit references • Event reporting				
Review the following assessment and documentation policies 1. N1505 Documentation of Patient Care: Inpatient Nursing 2. PC 128 Documentation of Patient Care				
Phlebotomy and specimen labeling – Review PC 172 (Phlebotomy Practices) and PC 137 (Labeling of Specimens)				
Review PC 149 – Falls Prevention • Fall risk bundle – ID band, sign, education for family, and fall assessment tool				

Orientation Class

Post-Orientation Pathway

- There is a 8 week post orientation pathway
- NICU Foundation Classes
 - » provide fundamental knowledge of neonatal physiology and pathophysiology to guide nurses in caring for critically ill neonates
 - » Facilitated by the Neonatal Nurse Practitioners
 - » STABLE
 - » Respiratory
 - » Cardiac STABLE
 - » GI/GU
 - » Neuro/Infections
 - » Emergency preparedness

Post Orientation Pathway

	Week 1	Week 2	Week 3	Week 4
Floor:	2nd	2nd	2nd	2nd
Type of	Stable Vents or	Stable Vents or	Infant on several gtt	Infant on several gtt
Assignment:	1 Vent/ 1 High Flow or	1 Vent/ 1 High Flow or	but not necessarily a	but not necessarily a
*Needs designated	1 Vent/1 CPAP	1 Vent/1 CPAP	1:1; HFOV, lines, &/or	1:1; HFOV, lines, &/or
resource person*	No admits, no more than 1 gtt	No admits, no more than 1 gtt	surgical pt if available	surgical pt if available
	Week 5	Week 6	Week 7	Week 8
Floor:	2nd	2nd	2nd	2nd
Type of	Infant on several gtt	1:1 if available	1:1 if available	1st Admit
Assignment:	but not necessarily a	(No ECMO or	(No ECMO or	If bumped: refer to week 2 or 3
*Needs designated	1:1; HFOV, lines, &/or	infant who is likely	infant who is likely	
resource person*	surgical pt if available	to be put on ECMO)	to be put on ECMO)	

* If bumped from 1:1 first admit or 2 vents or 1 vent/ 1 CPAP.

Orientation Class

- **COMMUNICATION**

- It is absolutely imperative that you communicate with your preceptors daily about your educational needs; you can also reach out to your educator ANYTIME and ALL the time.
 - Orientation is a *cumulative* process
 - » You will build upon each shifts learning
 - » If you don't understand the key concepts from the previous shift – you will struggle with your next shift and quickly fall behind in your orientation
- No such thing as a silly or bad question

Orientation Class

- Who to go to for what...
 - » Badge Access-Kim G.
 - » OmniCell Access-Kim G.
 - » Timeless Access-Kim G.
 - » Scrub Access-Kim G.
 - » SharePoint-Kathleen/Christina Billy
 - » Epic Issues-Fill out SARF through Intranet

Orientation Class

NICU: CICN/ CTCU/ MTCU

- NICU

- » Comprised of the CICN, CTCU, MTCU-71 beds in total
- » CICN-Comer Intensive care Nursery
- » CTCU-Comer Transitional Care Unit
- » MTCU-Mitchell Transitional Care Unit

- CICN

- » Intensive care unit in Comer on the 2nd floor – 47 beds
- » Is home to our tiniest and sickest babies
- » Patient ratios are 1:1, 2:1, 3:1 depending on infant's condition
- » The Charge and Code nurses are stationed here
- » The “fishbowl” (physician work room) is located here
- » Assignments are posted here

Orientation Class

NICU: CICN/ CTCU/ MTCU

- **CTCU**

- » Transitional care unit in Comer on the 4th floor – 18 beds
- » Is home to our more stable babies who are close to discharge
- » Infants can have oxygen and IV lines/fluids on this unit
- » Patient ratios are usually 3:1, but can be 2:1, 3:1, 4:1 depending on infant's condition

- **MTCU**

- » Transitional care unit in Mitchell on the 3rd floor – 6 beds
- » Is home to our more stable babies who are close to discharge
- » Is close to mother/baby unit
- » Infants can have peripheral IV lines/fluids on this unit
- » Patient ratios are usually 3:1, but can be 2:1, 3:1 depending on infant's condition

Orientation Class

Medical Staff

- Attending
 - » Neonatologist - directs the care of all babies in the NICU, and supervises fellows, residents, nurse practitioners, physician assistants, and medical students who are caring for NICU patients
- Neonatal Fellows
 - » Pediatrician who is training to become a neonatologist
- Neonatal Nurse Practitioner
 - » Advanced practice nurse trained in neonatology
- Neonatal Physician Assistant
 - » PA trained in neonatology
- Pediatric Residents
 - » Doctor who is training to become a pediatrician.
 - » Senior - second/third year resident
 - » Intern – first year resident

Orientation Class

Medical Staff

- Two types of care teams in the NICU
 - All babies will be assigned to a team
 - Overnight, one of the teams will cover all the babies
1. Resident Team
 - » Intern
 - » Senior resident
 - » Fellow
 - » Attending
 2. NNP / PA Team
 - » NNP/PA
 - » Fellow
 - » Attending

Orientation Class

Nursing Roles

- Manager
 - » Primary contact
 - » Will arrange your preceptors and set your orientation schedule
 - » Will meet with you and your preceptor intermittently to assess orientation progress and further needs
- Educator
 - » Carrie Smith-Hosman MSN, RN
 - » Secondary contact
 - » Will meet and check in with you throughout your orientation and post-orientation
 - » Education Committee
- Preceptor
 - » Very important person!
 - » Will teach you all they can about NICU nursing
 - » Will guide your orientation process
 - » Select assignments

Orientation Class

Nursing Roles

- **Charge Nurse**

- » Specially trained, experienced staff nurse
- » Receives a mini report on every NICU infant
- » Makes appropriate assignments for oncoming shift based on this report
 - » All changes in infant's condition need to be reported as soon as possible
- » Coordinates and manages staffing between NICU units and Comer hospital units
- » Is a resource for lab draws and peripheral IV insertions
- » Attends all NICU Emergencies
- » Helps where needed

- **Code Nurse**

- » Specially trained, experienced staff nurse
- » Attends at risk deliveries
- » Checks safety equipment in L&D and NICU
- » Goes out on neonatal transports
- » Helps set up bed spaces for upcoming admissions
- » Is a resource for lab draws and peripheral IV insertions
- » Attends all NICU Emergencies
- » Helps where needed

Orientation Class

Nursing Roles

- Admit Nurse
 - » Attends at risk deliveries with the Code Nurse
 - » Helps with checks of safety equipment in L&D and NICU
 - » Sets up bed spaces for upcoming admissions
 - » Helps where needed

Orientation Class

Typical Daily Routine

- Arrive to the unit and put lunch away in break room
- Punch in
 - » Remove all hand jewelry, bracelets and watches before entering NICU
 - » No nail polish
- Find your assignment
- Get report
- Perform an Avagard scrub
- Clean your area
- Review orders
- Perform safety checks
- Begin patient care

Report in the NICU



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Orientation Class Report in the NICU: Standardized Reporting

- Cardstock Report Sheet (a.k.a. Cardex) per each patient
 - » Stocked at front desk

NICU Report Sheet		Patient Label
Bed Spot: _____ Name: _____ DOB: _____		
Gestation: <u>X</u> w → _____ w Todays Age: _____ APGAR: ____/____/____		
Birth Weight: _____ Todays Weight: _____ Isolation: _____ Passcode: _____		
History	Maternal History	<input type="checkbox"/> Care Plan <input type="checkbox"/> Education <input type="checkbox"/> WALDO <input type="checkbox"/> Cart Sheet (Monday)
	Social	Developmental
		Safe Sleep Eligible? Y / N
Respiratory <input type="checkbox"/> Ventilator <input type="checkbox"/> Room Air ETT: _____ Taped @: _____ gum/lip Trach: _____ Change: _____ Cuff: _____ Rate: _____ PC: _____ PS: _____ Peep: _____ iTime: _____ FIO2: _____ % TV: _____ iNO: _____ ppm NAVA Level: _____ Taped @: _____ NAVA Change Date: _____ ----- <input type="checkbox"/> Oscillator ETT Size: _____ Taped @: _____ gum/lip MAP: _____ Hz: _____ Delta P: _____ FIO2: _____ % iNO: _____ Jiggle: _____ iTime: _____ ----- <input type="checkbox"/> NIMV <input type="checkbox"/> CPAP <input type="checkbox"/> HFNC <input type="checkbox"/> LFNC CPAP: _____ FIO2: _____ % Rate: _____ PC: _____ iTime: _____ NAVA Level: _____ Taped @: _____ gum/lip NAVA Change Date: _____ HFNC: _____ L FIO2: _____ % <input type="checkbox"/> TCOM? LFNC: _____ L FIO2: _____ % ----- Blood Gas Schedule Q: _____ Due @: _____ Last Gas @: _____ Last CXR @: _____ pH: _____ CO2: _____ HCO3: _____ PO2: _____	Cardiovascular	Neuro
		GI/GU
	UOP: _____	Last Stool: _____
	Skin/Bath	Assessment Schedule
	Bath Date: _____	<input type="checkbox"/> Cue Based <input type="checkbox"/> Q6 <input type="checkbox"/> Q4 <input type="checkbox"/> Q3 Last H/O @: _____ Due @: / / /
	Humidity: _____	Parameters
	Phototherapy: _____	Profile: _____ HR: _____ BP: _____ RR: _____ SPO2: _____

Orientation Class

Report in the NICU: Standardized Reporting

- **Report should include**

- » Pertinent history of mother and baby
- » Including diagnoses, procedures, test results
- » Current status
 - » What has occurred within the last 24 hours
 - » Assessment findings
- » Current Plan of Care
 - » Respiratory Support
 - » Total Fluids – Fluids/Drips & Feedings
 - » IV Sites & Tubes
 - » Labs
 - » Medications
- » Social history/issues

Orientation Class

Report in the NICU: Standardized Reporting

- It is an **expectation** that shift report be given at the bedside
 - » Both the off going and on coming nurse should be at the bedside with the patients chart open reviewing all current orders and verifying that all fluids/medications are infusing as ordered and are signed off.
 - » While at the bedside giving and receiving report conduct a thorough visual examination of your patient
 - » At the minimum include
 - » General appearance, respiratory support & IV sites
 - » This ensures you know the condition of the infant you are receiving or handing off



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- **Prepare at least 2 feedings for the next shift**
 - **Stock supplies for the next shift**
-

****Nursing is a TEAM sport****

Orientation Class

Nursing Resources

- » Nursing Resource Manual
- » Cooling Binder
- » Discharge Binder

- » SharePoint
 - » Search Bar
 - » Education Corner
 - » Practice Guidelines
 - » Pharmacy References
 - » Nursing Resource Binder
 - » Policies & Procedures
 - » NICU Medication Dosing Sheet
 - » Safety Event Reporting
 - » Micromedex
 - » IV Compatibility
- » LexiComp
 - » IV Compatibility

Orientation Class

- How to find SharePoint
 1. Login
 2. Open UCMC applications
 3. Go to the UCMC intranet homepage – scroll to the bottom right hand side
 4. Click on SharePoint Hub Directory
 5. Select M-P in the middle of the SharePoint Hub
 6. Scroll down to NICU and click the link



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Safety Checks

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Orientation Class

Safety Checks

- Performed at the beginning of EVERY shift
- ID bands on
- Monitor
 - » Alarms on
 - » Profiles set
- Bulb Syringe
- Ambu Bag
 - » Peep valve set to 5/or current peep
 - » Manometer in place
 - » Connected to 10L of blended oxygen
 - » FiO2 set 10–20% above current FiO2
 - » Appropriate size mask

Orientation Class

Safety Checks

- CO2 detector & ET tapes
 - » If intubated
- Neonatal Cart Sheet
 - » Current weight
- Consents
- Suction
 - » Canister in on position and connected to suction motor
 - » Suction set between 80-100mmHg
 - » Must occlude and verify
 - » 8 french suction catheter
 - » Appropriate size little sucker



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NICU Equipment

Orientation Class

Orientation Class NICU Equipment

- Translator



- R2 (Computer On Wheels)



Orientation Class

NICU Equipment

- Edy (iPad for Parent Education on GetWell Network)



- Bassinett



Orientation Class

NICU Equipment

- Crib



- Radiant Warmer



Orientation Class

NICU Equipment

- Isolette (Giraffe Omni Bed)
- Isolette used as Radiant Warmer



Orientation Class

NICU Equipment: Giraffe OmniBed

- Plug in
- Lock bed
- Power on
 - » Bottom right back
 - » Next to temp probe
- Temp probe
- Portholes
- Sides up/down
- Head up/down
- Rotating platform
- X-Ray tray
- Bed height up/down
- Canopy up/down
 - » Foot control
 - » Arrows
- Baby mode
- Manual control mode
- Air mode
- Humidity
 - » Water tray
- Help
- Timer
- Trend
- Set up
- Scale

Orientation Class

NICU Equipment: Giraffe Isolette

- A fan and heater beneath the bed circulates warm air around the infant
- Air Mode
 - » Isolette temperature is maintained at the set air temperature
 - » When transitioning closely monitor infants temperature – it is easy to over/under heat infant
- Baby (Servo) Mode
 - » Temperature probe is attached to infant and a set temperature is entered. The isolette will produce heat to maintain the infants temperature near the set temperature.
- Infant can be accessed through the portholes
- Air Boost
 - » Push before opening the portholes
 - » The fan speed will increase to help maintain isolette temperature
- Can provide Humidity

Orientation Class

NICU Equipment: Giraffe Radiant Warmer

- Canopy is raised and a radiant heating element directs (radiates) warmth on the infant
- Provides access to the infant
- Baby (Servo) Mode
 - » Temperature probe is attached to infant and a set temperature is entered
 - » The heating element will radiate the amount of heat needed to maintain the infants temperature near the set temperature
- Manual Mode
 - » Set percentage of heater power is chosen and is directed at the infant
 - » Use cautiously – it is easy to over/under heat infant

Orientation Class

NICU Equipment

- Scale



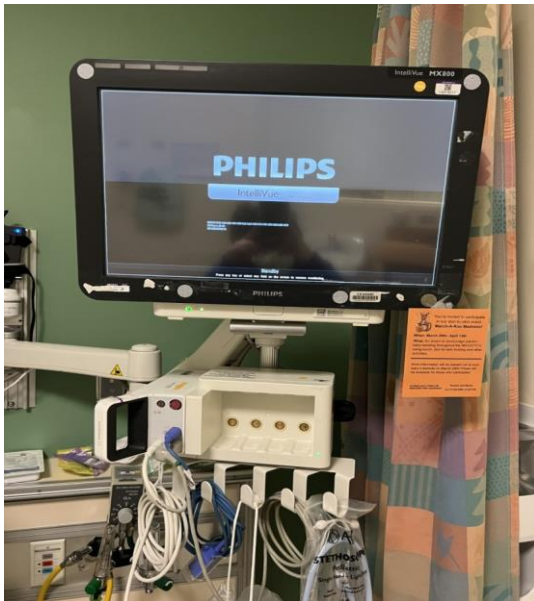
- Turtle Tub



Orientation Class

NICU Equipment

- Vital Sign Monitor



- NIRS (Somanetics)



- Kangaroo Pump for G-Tube Feeds



Orientation Class

NICU Equipment

- Medela Enteral Feeding Pump



- Baxter IV Pump



- Syringe Medication Pump



Orientation Class

NICU Equipment

Medela Breast Pump



- Medela Feeding Warmer



Orientation Class

NICU Equipment

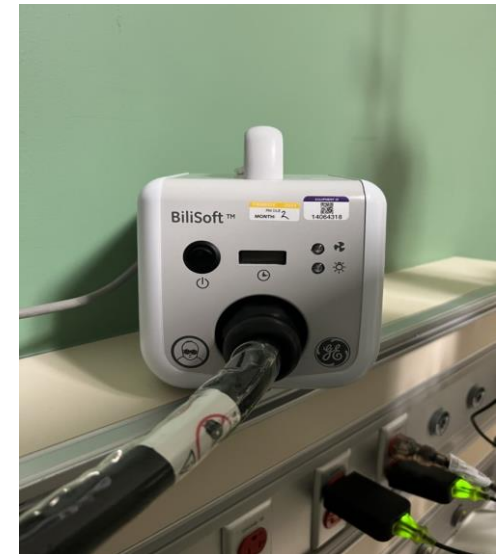
- Overhead Bili Light (Drager)



- Bili Blanket with Stand



- Bedside Bili Blanket



Orientation Class

Neonatal Assessment

- <https://www.youtube.com/watch?v=IkDZIKWYewk>



Orientation Class

Medication Administration

- When a provider writes a medication order do not “blindly” sign
- Always remember your 7 rights of medication administration.
 - » **Right Patient**
 - » **Right Medication**
 - » **Right Dose**
 - » **Right Time**
 - » **Right Route**
 - » **Right Reason**
 - » **Right Documentation**

Orientation Class

Medication Administration

- » It is your responsibility to be knowledgeable about the drug actions, side effects, contraindications, precautions, and other drug-specific guidelines/nursing implications for the drug administration.
 - » Utilize LexiComp, Micromedex, Nursing Resource Manual and SharePoint for this information.
- » Don't forget to check medication expiration date/time before administration.
- » Always verify that the correct volume of the medication is in the syringe before administering.
- » Verify if your patient has any medication allergies
- » You must check the compatibility of all solutions and medications infusing in a IV line before administering an IV medication.
- » All IV continuous infusions and IV medications must be infused using the appropriate pump and corresponding drug infusion library.

Orientation Class

Medication Administration

- Documentation of administration should be in real time.
- At the time of administration you must compare and verify your patient identifiers (patient name & medical record number) from the ID band that is on your patient with the electronic medication record and the medication label.
- Once verified scan the ID band, then scan the medication and immediately administer it.
- Medication is considered to be administered on time if administration occurs within 1 hour before or 1 hour after the scheduled administration time.
 - » Check the previous administration time to verify that the appropriate amount of time between administrations has elapsed

Respiratory Support



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Orientation Class

Respiratory Support

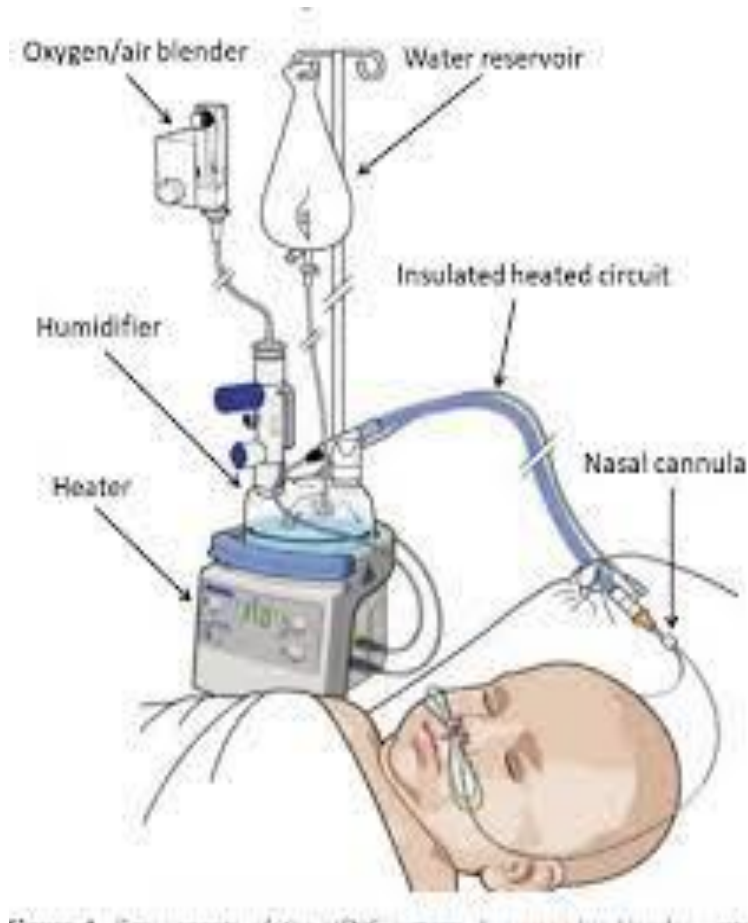
- NC – Nasal Cannula
- Small soft plastic prongs placed in infants nares
 - » air and oxygen go from the prongs into infants lungs
- Should be connected to a bubbler (aquapak)
 - » provides humidification
- 0.1L to 2L flow
 - » In NICU prolonged flows 2L and above require high flow nasal cannula (HFNC)
- 21% to 100% FiO₂ | Cannula



Orientation Class

Respiratory Support

- HFNC – High Flow Nasal Cannula
- Small soft plastic prongs placed in infants nares
 - » air and oxygen go from the prongs into infants lungs
- Connected to a heater/humidifier
 - » provides warmed and humidified air/oxygen
- 2L to 4L flow
 - » Can be used for flow rates under 2L but not required
 - » In NICU flows above 4L require advancement to nasal continuous positive airway pressure (nasal CPAP)
- 21% to 100% FiO₂



Orientation Class

Apnea, Bradycardia and Desaturations

- **Apnea**
 - » Cessation of respiration (breathing) for 20 seconds or longer
- Three types of apnea
 - » Central Apnea
 - » Caused by decreased central nervous system stimuli to respiratory muscles
 - » Both respiratory effort and airflow cease simultaneously
 - » absence of chest wall movement and airflow
 - » Obstructive Apnea
 - » Caused by pharyngeal instability/collapse, neck flexion or nasal obstruction
 - » Absence of airflow in the presence of inspiratory efforts
 - » There is chest wall movement but no airflow
 - » Mixed Apnea
 - » Has a mixed cause. Central apnea is either preceded (usually) or followed by an obstructed respiratory effort
- Documentation Parameters
 - » *Apnea for >20 seconds*

Orientation Class

Apnea, Bradycardia and Desaturations

- **Bradycardia**
 - » heart rate below the normal range for infants gestational age (less than 100 bpm per NRP)
- Documentation Parameters
 - » *Heart rate <80 bpm for 10 continuous seconds*

- **Oxygen Desaturations**
 - » Drop in oxygen saturation below normal determined by the monitor profile selected based on infants gestational age
- Documentation Parameters:
 - » *Oxygen saturation <90% for more than 10 continuous seconds or Oxygen saturation below normal determined by monitor profile selected based on infants gestational age*

Orientation Class

A's, B's and D's: Documentation

Apnea & Bradycardia	
☰ Apnea	No
Seconds of Apnea	
☰ Bradycardia	Yes
Lowest HR	76
Seconds of Bradycardia	12
☰ Desaturation	No
Desat	
Duration of Desaturation	
Skin Color	Pink
Interventions	Gentle stimulat...
Activity During Episode	Quiet Awake
Response to Interventions	Return to initial...
☰ Provider notified?	No
Provider Name	

Orientation Class

Temperatures

- Axillary temperatures only
- Always verify infants skin temperature readings on isolette/radiant warmer by doing an axillary temperature with assessments.
- Infant temperature must be at least 36.5 °C to feed
- If an infant has a low temperature for no apparent reason
 - » Rewarm infant, asses for other signs of illness and notify the medical team
 - » This is a sign of sepsis

Orientation Class

NG/OG Feeding

- Small, soft tube that is inserted through infant's mouth or nostril, down the back of their throat, through the esophagus and into their stomach
- **Insertion**
- A medical order is needed for insertion of oro/nasogastric tubes
- Oro/nasogastric tubes may be inserted by registered nurses who have demonstrated competency
- The date of insertion, size and anatomical placement (i.e. cm at nares/mouth) of the feeding tube should be documented in the medical record
- *Placement verification is to be done*
 - » *By observation of tubing exit mark, aspiration of gastric contents, and auscultation of small air bolus prior to each use!!!!*
- Assessment of placement must be done at least once a shift and prior to initiating feeding/medication delivery, to confirm that the tube has remained in the correct position
- Placement verification is to be documented in the medical record

Orientation Class

NG/OG Feeding

- Hang times for human milk and formula in the NICU should be 4 hours or less
 - » Feeding extension tubing must be changed with every feed or at least every four hours
- **REMOVAL**
- A medical order is needed is needed for removal of oro/nasogastric tubes
- 2. Nurses who have demonstrated competency may remove oro/nasogastric tubes
- Removal of oro/nasogastric tubes must be documented in the medical record

Orientation Class

NG/OG Feeding

- Nasogastric



- Orogastric



Orientation Class

Medela Feeding Pump

- Bolus Feeding Administration
 1. Load feeding syringe
 2. Power on pump
 3. Select vol/time
 4. Select syringe type as MDLA for Medela
 5. Program volume to be administered
 6. Program length of infusion
 7. Select deliver to start administration






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Oxygen Saturations in the NICU

- Θ sats < 90% (exceptions-Congenital Cyanotic  Lesions)
- Monitor saturations using **set upper/lower limits** according to NICU guidelines

EQUIPMENT

- Ambu Bags-FiO₂ set 10-15% above the required FiO₂
- Pressure manometers **required** on all patient ambu bags

DESATURATIONS

- Toleration of mild desaturations permitted
- If needed, ↑O₂ in 2-4% increments
- O₂ breaths via ventilator **not** advised as 1st rescue measure
- If necessary-give start breaths at current FiO₂ and then ↑ by 10% of no response
- If using hand ventilation, be sure to bag with pressures consistent with settings
- Suction support breaths should **not** exceed 10-15% of baseline FiO₂
- Attempt to wean back to baseline prior to leaving bedside

TITRATION/WEANING

- Wean O₂ for saturations above the upper limits (exceptions-infants going home on O₂)
- Titration of O₂ up/down rapidly **not** permitted; wean **slowly**
- Weaning not permitted in patients with PPHN without provider order

NURSING

- Patient assessment & documentation required with every permanent ↑ in FiO₂(including increased requirements during feeds)
- Medical staff (MD, NNP) to be notified if sustained change in FiO₂ > 10%

REMINDERS

- SpO₂ lead position should be changed q6-8 hrs

NOTES

- Apnea not treated with ↑ in O₂. Try stimulation, ventilation change, or manual bag
- 1% decrease in FiO₂=10mmHg decrease in PaO₂
- Sudden ↑ or ↓ in O₂ concentration leads to sudden ↓ or ↓ in PaO₂ which can lead to pulmonary vasodilation/vasoconstriction

***Review newly approved O₂ saturation guidelines**

**The University of Chicago Medical Center
Neonatal Intensive & Intermediate Care Units
Practice Guideline**

Title: Percutaneous Central Venous Catheter (PCVC) Maintenance; assessment and dressing change

Purpose: To provide guidelines to enable staff to safely care for patients with PCVC lines. The catheter insertion site will:

1. Demonstrate an intact, secure dressing
2. Remain free from infection

Indications:

- Patients with PCVC lines in place
- Patients with PCVC lines in need of dressing change

Procedure:

A. Assessment

- PCVC dressing and site will be assessed hourly
- Full PCVC assessment (all rows in EPIC) will be documented by RN twice per shift
Dayshift-7am & 6pm
Nightshift-7pm & 6am
- No Change (NC) can be used after initial assessment if no change from previous assessment (except 6pm & 6am assessment)
- Out-going & In-coming RNs will perform full line assessment to include dressing, IV fluids, IV fluid rates, pump libraries, tracing of lines, and depth of insertion

B. Dressing Change

1. Identify maintenance team member to perform dressing change
2. Obtain supplies and central line dressing kit

Central Line Kit Supplies:

- 2 Applicator Prep (2% Chlorhexidine Gluconate [CHG])
- 2 tape strips
- 1 tegaderm drsg (small)
- 1 poly-back drape
- 1 mask
- 1 forcep
- 8 gauze
- 1 saline wipe
- 1 sterile glove (medium)
- 1 tray

1 scissor
*need to obtain mask, hat

Additional supplies needed:

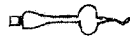
Non-sterile gloves
Additional face mask for assistant
Large tegaderm if needed

3. Perform hand hygiene.
 4. Prepare work area by donning non-sterile gloves and cleaning table surface with disinfectant wipes.
 5. Remove gloves and perform hand hygiene.
 6. Open central line dressing kit and remove mask.
 7. Don hat, mask and clean gloves.
 8. Loosen steri-strips (manually) from old transparent dressing.
 9. Remove old dressing while stabilizing catheter hub. Peel the dressing toward the insertion site ONLY. Hold line with a CHG swab if necessary to maintain security of line.
 10. Inspect site for signs of infection.
 11. Remove and discard gloves. Perform hand hygiene and place dressing supplies on a sterile field. Don sterile gloves.
 12. Note catheter length extending from insertion site and compare to documentation.
 13. Cleanse insertion site with two 2% CHG swabs
 - First swab for 15 secs starting at insertion site using a back and forth motion to an area as big as the transparent dressing
*allow CHG to dry for 30 secs
 - Second swab for 15 secs starting at insertion site using a back and forth motion to an area as big as the transparent dressing
*allow CHG to dry for 30 secs
- ** Any patient <28 weeks gestation who is <10 days old = remove CHG with sterile saline and allow to dry for 30 seconds. Any patient <28 weeks gestation who is >10 days old = DO NOT remove CHG.**
- EXCLUSION: Any patient where skin integrity is in question use betadine for skin preparation.**
14. Anchor the PCVC with a steri-strip placed across the disc of the Catheter.
 15. Place the transparent dressing over the insertion site, covering the entire base.
 16. Using the “chevron” technique, place a steri-strip under the catheter extension, crossing the base and on top of the transparent dressing.
**Proper placement of this strip is essential to insure a mechanical fitting between the catheter and the dressing, preventing migration.*

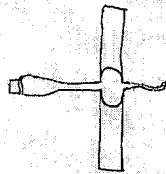
17. Place third steri-strip as shown, to reinforce chevron. An additional steri-strip may be placed to provide maximum anchorage of the PCVC.
18. Label the dressing with the date and initials.
19. Document assessment and dressing change in EPIC.
20. Communicate any abnormal catheter assessment findings to house officer, MD/NNP, or fellow.

Visual

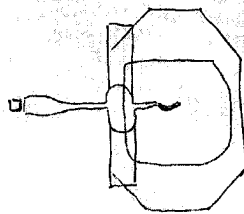
1. Position catheter at a slight offset.



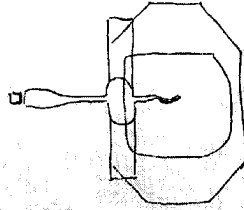
2. Anchor the catheter with a steri-strip placed across the base of the catheter.



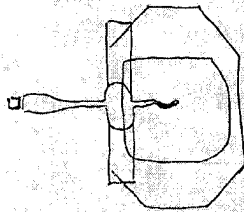
3. Place the transparent dressing over the insertion site, covering the entire base.



4. Using the “chevron” technique, place a steri-strip under the catheter extension, crossing the base and on top of the transparent dressing. Proper placement of this strip is essential to insure a mechanical fitting between the catheter and the dressing, preventing migration.



5. Place third steri-strip as shown, to reinforce chevron. An additional steri-strip may be placed to provide maximum anchorage of the PCVC.



*A neutral flow displacement connector should be attached to the end of the catheter.

References

- Association of Women's Health, Obstetric and Neonatal Nurses (2013). Disinfectants. In 3rd Eds., *Neonatal Skin Care, Evidence-Based Clinical Practice Guideline* (pp. 30-35). Location: Washington.
- Chouduri, J., McQueen, R., Inoue, S., & Gordon, R.C. (1990). Efficacy of skin sterilization for a venipuncture with the use of commercially available alcohol or iodine pads. *American Journal of Infection Control*, 18, 82-85
- Harpin, V.A. & Rutter, N.(1982) Percutaneous alcohol absorption and skin necrosis in a preterm infant. *Archives of Disease in Childhood*, 57, 477-479.
- National Association of Neonatal Nurses. (2011). *Peripherally Inserted Central Catheters Level II and III Nurseries*. In L.M. Ikuta & S.S. Beauman, *Policies, Procedures, and Competencies for Neonatal Nursing Care* (pp. 141-144). Glenview: National Association of Neonatal Nurses
- Sharpe, EL. (2008). Tiny Patients, Tiny Dressings: A guide to the neonatal PICC dressing change. *Advances in Neonatal Care*, 8(3), 150-162

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January, 2015



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Neonatal Intensive Care Unit



Pocket Buddy

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Hello and Welcome to the NICU!

We are very excited to invite you into our NICU team. Your orientation will be individualized to your specific needs. In order to accomplish this, we have put together some resources that we hope will support any learning needs that you may have while on orientation. The orientation process is recognized as an essential and necessary activity for all new University of Chicago employees. The overall goal of our orientation process is to prepare each new nurse to be able to provide competent, knowledgeable patient care, with the aim to provide quality health care to our patients while ensuring a supportive work environment.

Your orientation will be focused on understanding the institutional values, policies, procedures, and operational routines. You will also learn about your role, responsibilities and functions as a nurse in the NICU. Within your unit-specific orientation, you will be caring for NICU patients with varied acuity levels. You will follow an individualized pathway that will assist you and your preceptor in communicating with the charge nurse to select appropriate patient assignments for each shift on orientation. CCPP staff and leadership team will meet in-person with you and your preceptor. These meetings will discuss any needs you may have, what you feel you're doing well with, and what goals you would like to meet in the following week. The goal of these meetings is to support you in your orientation and ensure the best outcomes for your learning and our NICU patients.

 **Scan the QR Code**

The survey link has been converted into a QR code, which can now be scanned by a device that has an app capable of reading QR codes. Once the QR code below is scanned, it should take the respondent directly to the survey in a web browser.



Please fill out a weekly survey on your progress using this code.

We are excited to have you on our team and anticipate a successful orientation experience! If you have any questions about your orientation process, please contact a leadership team member *and* CCPP staff as this promotes open-communication among all involved. Thank you and welcome!



PEDIATRIC VITAL SIGNS REFERENCE CHART



Heart Rate (beats/min)			Respiratory Rate (breaths/min)	
Age	Awake	Asleep	Age	Normal
Neonate (<28 d)	100-205	90-160	Infant (<1 y)	30-53
Infant (1-12 mos)	100-190			
Toddler (1-2 y)	98-140	80-120	Toddler (1-2 y)	22-37
Preschool (3-5 y)	80-120	65-100	Preschool (3-5 y)	20-28
School-age (6-11 y)	75-118	58-90	School-age (6-11 y)	18-25
Adolescent (12-15 y)	60-100	50-90	Adolescent (12-15 y)	12-20

Reference: PALS Guidelines, 2015

Blood Pressure (mmHg)				
Age		Systolic	Diastolic	Systolic Hypotension
Birth (12 h)	<1 kg	39-59	16-36	<40-50
	3 kg	60-76	31-45	<50
Neonate (96 h)		67-84	35-53	<60
Infant (1-12 mos)		72-104	37-56	<70
Toddler (1-2 y)		86-106	42-63	<70 + (age in years × 2)
Preschool (3-5 y)		89-112	46-72	
School-age (6-9 y)		97-115	57-76	
Preadolescent (10-11 y)		102-120	61-80	<90
Adolescent (12-15 y)		110-131	64-83	

*Reference: PALS Guidelines, 2015
For diagnosis of hypertension, refer to the 2017 AAP guidelines Table 4 & 5:
<http://pediatrics.aappublications.org/content/early/2017/08/21/peds.2017-1904>*

Temperature (°C)		Oxygen Saturation (SpO ₂)
Method	Normal	
Rectal	36.6-38.0	SpO ₂ is lower in the immediate newborn period. Beyond this period, a SpO ₂ of <90-92% may suggest a respiratory condition or cyanotic heart disease.
Tympanic	35.8-38.0	
Oral	35.5-37.5	
Axillary	36.5-37.5	
Ranges do not vary with age. Screening: axillary, temporal, tympanic (↓ accuracy) Definitive: rectal & oral (↑ reflection of core temp.) <i>Reference: CPS Position Statement on Temperature Measurement in Pediatrics (2015)</i>		

Dr. Chris Novak & Dr. Peter Gill for www.pedscases.com
(Edited March 2020 by Richard He)

Heart Rate

Premature Infants: ~140-160

Term Infants: ~90-160

Mean Arterial Pressures

Minimum acceptable is usually \geq to infant's CGA

Goal O2 Sats

Premature Infants: ~88-93%

Term Infants: 95-100%

Temperature

Axillary Only: 36.5-37.5° (NO RECTAL!)

Respiratory Rate

Preterm: ~40-60 breaths/min

Full Term: ~20-60 breaths/min

NICU WORK FLOW

Prior to entering the entering the NICU

Tube Station is 809 Code is 9-8-7-6

- Remove of all hand jewelry and bracelets prior to entering the NICU.
- No nail polish

Prior to entering the patient bed space

- Use AVAGARD (waterless, brushless scrub) at the beginning of your shift. Remember to apply to clean, dry Hands. Avagard stations are located at the entrance of the unit and at each bed spot

DOCUMENTATION – EPIC Flowsheets and Reports – DEPT in EPIC = CICN

- | | |
|---|--|
| <ul style="list-style-type: none"> <input type="checkbox"/> NICU Vital Signs <input type="checkbox"/> NICU 2 Asses <input type="checkbox"/> NICU Daily <input type="checkbox"/> WALDO <input type="checkbox"/> I-O <input type="checkbox"/> Blood Transfusion | <ul style="list-style-type: none"> <input type="checkbox"/> Pre-Op Checklist <input type="checkbox"/> Final Verification <input type="checkbox"/> NNCCU <input type="checkbox"/> NICU Discharge <input type="checkbox"/> Neonatal Cart sheet (print an updated sheet qMon on days with updated dosing weight) |
|---|--|

DAILY ROUTINES

UCM Special Practices

- Cooling blanket esophageal probes inserted by attendings, fellows, or NNPs only
- UAC/ UVC are NOT to be removed by RNs
- NAVA catheters inserted and manipulated by attendings, fellows, or NNP only
- NG tube placement (even for poor feeders) always requires an order

Use cover gowns appropriately:

- For patients on isolation – use a new gown with each patient contact
- For non-isolation patients – wear a gown when holding the baby (may use same gown for same baby during the shift)
- Long sleeve clothing must be pulled above elbows when performing any type of care

Frequency of Vitals & Assessments

- Data Validate Vitals from monitor every 1 hour
 - o Any ICU and Transitional Care Patient
- Vitals from monitor at least every 1 hour and more frequently PRN
 - o Any patient with a vasoactive drip infusing
 - o Any patient experiencing respiratory or cardiac instability
- Hands-on assessments q 4 hours
 - o for any 1:1 patient
 - o For all NPO patients
 - o For po feeders who are ad lib (max of 4 hours)
- Hands-on assessments every 3 hours for any patient requiring q 3 hour feeds
- Document & Assess central lines & PIV's q1 hour
- Follow the 72 hour protocol for the VLBW infants (see corresponding order set)

- Temperature
 - o **All patients = axillary temps only (no rectal temps)** with hands-on assessments or prior to feeds.
 - o Any patient less than 36.5 degree Celsius:
 1. Do not feed. Reassess temp.
 2. If temp is still < 36.5, attempt to re-warm and contact provider

- Skin condition score with every hands-on assessment
- IV sites and any pumps are checked hourly

Central Lines

- Trace lines at hand-off and check IV fluids and medications as ordered
- Assessment & Documentation of site q 1hour
- Document all rows twice a shift: **Days:** 0700 & 1800, **Nights:** 1900 & 0600.
- NC is acceptable in middle of shift if no change

Pain and Sedation Assessments

- NPASS Pain and Sedation score with every assessment/interventions and within 30 min after IV meds given and 1 hour after PO/NG meds given

Labs

- Call RT prior to drawing ABGs, unless it's between the hours of 0400-0630

Daily Care

- Baths are given on days per bathing algorithm
- Trach changes weekly as indicated in EPIC
- Trach ties are q 24 hours (or if become soiled)
- Weight q day shift
- Length and head circumference q Sun on days
- PICC dressing changes are PRN. If a dressing is loose, notify the charge nurse
- Central line dressing changes q Sun on days

NUTRITION

Breast milk location

- ❑ Every 2 bed spots share a refrigerator with a patient specific labeled bin
- ❑ Freezers for breast milk storage are located in the 2nd floor alcove across from clean supply room
- ❑ Donor Milk Refrigerator in k230 – Follow donor milk flow diagram in resource binder

Breast milk storage and use

- ❑ Fresh breast milk that has never been refrigerated may be kept at infant's bedside at room temperature for no more than 4 hours.
- ❑ Fresh breast milk that has never been frozen may be stored up to 96 hours at refrigerator temperature
- ❑ Frozen breast milk should be used in the order it was expressed (oldest expressed dated should be used first)
- ❑ Thawed breast milk that has not been warmed must be used within 24 hours of thawing or must be discarded
- ❑ Breast milk which has been fortified and refrigerated should be used within 24 hours of fortification or must be discarded.

Formula storage

- ❑ Formulas prepared by formulary nutrition should be refrigerated and are good for 24 hours

Formula/Breast milk administration

- ❑ Continuous NG feeds: Change tubing & syringe q4 hrs for breast milk & formula
- ❑ All formulas/breast milk syringes must be labeled indicating the appropriate contents of the syringe
 - ❑ When using the orange feeding pumps or syringe pumps to administer breast milk via NG, the pumps should be upright (vertical) with the plunger towards the floor to enhance breast milk fat delivery

Documentation

- ❑ Breast milk and Donor Milk: always scan using the Timeless system before administering
 - ❑ **ALL** feedings require documentation on the eMAR AND on the I/O flowsheet

UNIT RESOURCES

Managers:

Christina Billy-Office: 773-702-1247

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Alicia Gamboa-Office: 773-702-9047

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Assistant Manager:

Kimberly Gonzalez-Office: 773-702-3639

Kimberly.Gonzalez2@uchicagomedicine.org

Manager On-Call Pager - #8366

- ❑ Charge RN pager: 4765 Phone: 5-6505
- ❑ Code RN pager: 5598 Phone: 5-6404
- ❑ Unit Secretary (PSC), NSAs, and PSAs are additional resources

Clinical Nurse Educator:

Clinical Nurse Specialist:

Amanda Erman-Office: 773-834-3788; pager 6268

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***As of 05/2023**



EMERGENCIES

ICU (2nd Floor of Comer)

- Monitor alarms do NOT connect to assigned RN phone
- Two nurses must be present per pod at all times

CTCU (4th Floor of Comer)

- Monitor alarms connect to assigned RN phone
- At least 2-3 nurses on floor at all times
- For a code or other emergency: hit red “staff assist” or blue “code” button on wall at head of bed. Neonatal medical team will respond immediately plus all RN phones in NICU will ring.

Patient off of unit for a test OR in MTCU (Located on 3rd floor of Mitchell)

- For a code: dial **1-5-9** and state location and neonatal emergency. Neonatal code blue team will respond.

Safety & Emergency Preparedness



**The University of Chicago Medical Center
Neonatal Intensive Care and CTCU/MTCU
Safety Practices**

At the beginning of the shift assesses the following:
Emergency equipment is at the bedside, is appropriate size, and is functioning
Monitor alarm parameters are appropriate for the patient's diagnosis and activated
Ventilator settings are correct and have a corresponding order
IV fluids are appropriate, infusing through the correct line, at the correct rate
IV drips are at appropriate dose, infusing at correct rate, with correct pump library
Patient ID bands are on the infant
Neonatal cart sheet placed at the bedside in the chart, with current dosing weight
MD/NNP orders signed off and carried out
Follows National Patient Safety Goals:
Uses 2 appropriate patient identifiers when providing care, treatment and services
Prior to a surgical procedure, ensure a pre-op checklist is completed in EMR
When receiving critical test results, WRITE down the lab results, then READ BACK to the lab personnel
Uses SBAR to communicate patient information to MDs/NNPs and other disciplines
Routine:
Assesses and documents IV sites hourly
Double checks high risk medication with another RN, regardless of hard stop in EPIC or not <i>ex) electrolyte riders, precedex drips, and scheduled or 1 x doses of narcotics do not ask for a double signature, so please double check!</i>
Scan patient prior to administration of medication and breastmilk
Uses code word (last 4 numbers on infant's band) to identify callers
Checks parents/visitors are wearing appropriate identification bands
Wears employee ID badge on upper body

Neonatal CART Sheet
 Pediatric ENT 188-3687
 Anesthesia 188-7000

Name: **BabyTWOKeegan ZzTest**
 Height: (not recorded)

Age: 8Mos

DOSING Weight: 15 kg (33 lb 1.1 oz)

RESUSCITATION		
Medication	Dose/Volume	Patient's Dose
Adenosine (3mg/mL)	Dose: 0.1 mg/kg - 0.2 mg/kg Volume: 0.033 - 0.067 mL/kg	1stDose: 0.5 mL 2ndDose: 1.01 mL
Atropine (0.1 mg/mL)	Dose: 0.02 mg/kg Volume: 0.2 mL/kg	3 mL
Calcium Gluconate 10% (100 mg/mL)	Dose: 100 mg/kg Volume: 1 mL/kg	10 mL
Dextrose 10% (0.1 g/mL)	Dose: 0.2-0.5 g/kg Volume: 2-5 mL/kg	30 - 75 mL
NRP IV/IO EPINEPHrine (0.1 mg/mL)	Dose: 0.02-0.03 mg/kg IV/IO Volume: 0.2-0.3 mL/kg IV/IO	3 - 4.5 mL
PALS IV/IO EPINEPHrine (0.1 mg/mL)	Dose: 0.01 mg/kg IV/IO Volume: 0.1mL/kg IV/IO	1.5 mL
NRP/PALS ETT EPINEPHrine (0.1 mg/mL)	Dose: 0.1 mg/kg ET Tube Volume: 1 mL/kg ET Tube	10 mL
Naloxone (Narcan) (0.4 mg/mL)	Dose: 0.1 mg/kg Volume: 0.25 mL/kg	3.75 mL
Sodium Bicarbonate 4.2% (0.5 meq/mL)	Dose: 1-2 meq/kg/dose Volume: 2-4 mL/kg	30 - 60 mL
Sodium Chloride 0.9% "BOLUS"	Amount : 10-20 mL/kg	150 - 300 mL
PULMONARY HEMORRHAGE		
Medication	Dose/Volume	Patient's Dose
Pulmonary Hemorrhage ETT EPINEPHrine (0.1 mg/mL)	Dose: 0.01 mg/kg ET Tube Volume: 0.1 mL/kg ET Tube <i>*Use NRP/PALS dose if hemodynamic instability</i>	1.5 mL
INTUBATION		
Medication	Dose/Volume	Patient's Dose
Cisatracurium (2mg/mL)	Dose: 0.2 mg/kg Volume: 0.1 mL/kg	1.5 mL
Rocuronium (10 mg/mL)	Dose: 1 mg/kg Amount: 0.1 mL/kg	1.5 mL
fentaNYL (NICU = 5 mcg/mL)	Dose: 1-2 mcg/kg Volume: 0.2-0.4 mL/kg	3 - 6 mL
Midazolam (1mg/mL)	Dose: 0.1 mg/kg Volume: 0.1 mL/kg	1.5 mL
CARDIOVERSION/DEFIBRILLATION		
Defibrillation	Dose: 2 j/kg, then 4 j/kg	1st: 30 j Then: 60 j
Cardioversion	Dose: 1 j/kg, then 2 j/kg	1st: 15 j Then: 30 j

RN Signature: _____

RN Signature: _____

EPINEPHRINE for PULMONARY HEMORRHAGE

Pulmonary hemorrhage: appearance of fresh blood in the endotracheal tube or trachea

- ✓ Involves clinical deterioration (worsening respiratory status & poor perfusion)
 - Signs and symptoms include apnea, generalized pallor, cyanotic with bradycardia and hypotension
- ✓ Usually accompanied by a drop in hematocrit and abnormal chest x-ray
- ✓ Occurs most commonly in the first few days after birth
 - Risk factors include prematurity, intrauterine growth restriction, PDA, coagulopathy, mechanical ventilation, sepsis, and surfactant therapy

Management Strategies

Goal: preventing exsanguination while ensuring proper gas exchange

Medication Management Strategies

- ✓ **Endotracheal epinephrine**
 - Mechanism of Action: vasoconstriction of the local area
 - What product?
 - Epinephrine 0.1 mg/mL (100 mcg/mL) carpject
 - Dose:
 - In mg/kg (weight): 0.01 mg/kg/dose
 - In mL/kg (volume): 0.1 mL/kg/dose
 - *NOTE: This is 1/10th the dose you would give for ETT epinephrine in NRP or PALS. For pulmonary hemorrhage in a patient who is **ALSO** receiving chest compressions, use the normal NRP/PALS dosing (0.1 mg/kg = 1 mL/kg).
 - Administration: into the endotracheal tube or trachea



RAPID SEQUENCE INTUBATION (RSI)

There are three types of medications used to perform RSI and they must be ***given in this order***:

1. Pre-medication (not always required)
2. Induction agent
3. Neuromuscular Blocking Agent (Paralytic)

Preferred Medications at UCM	Rationale
Pre-Medication (optional): Atropine	Prevention of reflex bradycardia due to an exaggerated vagal response and help to dry secretions
Induction agent: Fentanyl Optional 2 nd induction agent: Midazolam	Renders the patient unconscious prior to paralysis, provides amnesia, blunt sympathetic responses, and can improve intubating conditions
Paralytic: Cisatracurium	Immobilize patient to perform intubation

Medication Dosing & Administration Table Reference

Medication	Class of Medication	Dose	Location/How Supplied	How to Administer
Atropine	Anti-cholinergic	0.02 mg/kg	Omniceil: Comes as a 0.1 mg/mL (1 mg in 10 mL) syringe	Rapid IV Push Slow injection may result in paradoxical bradycardia
Fentanyl	Opioid	1-2 mcg/kg	Omniceil: Comes as a pharmacy-prepared 5 mcg/mL (5 mcg in 1 mL) syringe	Slow IV Push to avoid muscle rigidity
Midazolam	Benzodiazepine	0.05-0.1mg/kg	Omniceil: Comes as 1mg/mL (2 mg in 2 mL) vial	IV push over 2-5 minutes
Cisatracurium	Paralytic	0.1- 0.2 mg/kg	Omniceil Refrigerator Comes as a 2 mg/mL (10 mg in 5 mL) vial	Over 5 to 10 seconds



University of Chicago Medical Center: Neonatal Intensive & Intermediate Care Units

Drug Calculations Practice Problems and Pump Libraries

- Objectives: The RN will be able to:
 - Calculate intermittent and continuous medications accurately.
 - Identify correctly and incorrectly programmed pumps.

- Syringe Pump medication safety software
 - All medications, feedings, blood products, and lipids must be programmed using the drug library.
 - Pump labels (medication, dosage, concentration, weight) must accurately reflect what is currently infusing.

Conversions to know:	
1kg=1000g	1kg=2.2 lbs
1g=1000mg	1hr= 60 minutes
1mg=1000mcg	1L=1000mL

Example 1

You have an order for a **continuous** infusion of fentaNYL to run at 1.5mcg/kg/hr.

The order is as follows:

<u>Medication Order in EPIC</u>
Fentanyl 250 mcg in D5W – 25mL IV (PEDS)
Ordered Dose: 1.5 mcg/kg/hr x dosing weight
Dosing weight: 1.8 kg

**Use Lexicomp, UCM Formulary, or Micromedex to verify* (this should be a standard practice in verifying any drug orders and medication calculations).*

Once you have verified that the ordered concentration matches the concentration listed on the syringe label, calculate how many mL/hr will be delivered (the rate of the pump).

Use this formula:

What I want: mL/hr **What I have:** Ordered dose = 1.5 mcg/kg/hr

Weight= 1.8 kg

Concentration= 250mcg/25ml = 10 mcg/mL ✓

$$(\text{dose}) \times (\text{wt}) \times (\text{concentration}) = (\text{Infusion Rate})$$

$$\frac{\text{mcg}}{\text{kg/hr}} \times \frac{\text{kg}}{1} \times \frac{\text{mL}}{\text{mcg}} = \text{mL/hr} \quad \text{*Make sure all your units cancel out, leaving you with ml/hr}$$

$$\frac{1.5\text{mcg}}{\text{kg/hr}} \times \frac{1.8\text{kg}}{1} \times \frac{1\text{mL}}{10\text{mcg}} = \mathbf{0.27\text{mL/hr}}$$

- A nursing Double Check at the time of administration will be documented by two RNs. Complete this documentation and verification in the Electronic Medical Record.
- Nursing Double Checks will occur at each of the following steps: Drug initiation, rate or program change, order change, new infusion bag/syringe, and at shift change. Complete documentation and verification in the Electronic Medical Record.

Verify if this medication infusion pump is correctly programmed to administer the correct medication at the ordered dose, at the correct rate, with the correct concentration, and the correct dosing weight.



Example 2

You have an order for a fentaNYL **bolus from bag**. Ordered bolus is for 2mcg/kg.

The order is as follows:

Medication Order in EPIC

fentanyl 250 mcg in D5W – 25mL IV (PEDS)
Ordered Dose: 2 mcg/kg x dosing weight
Dosing weight: 1.8 kg

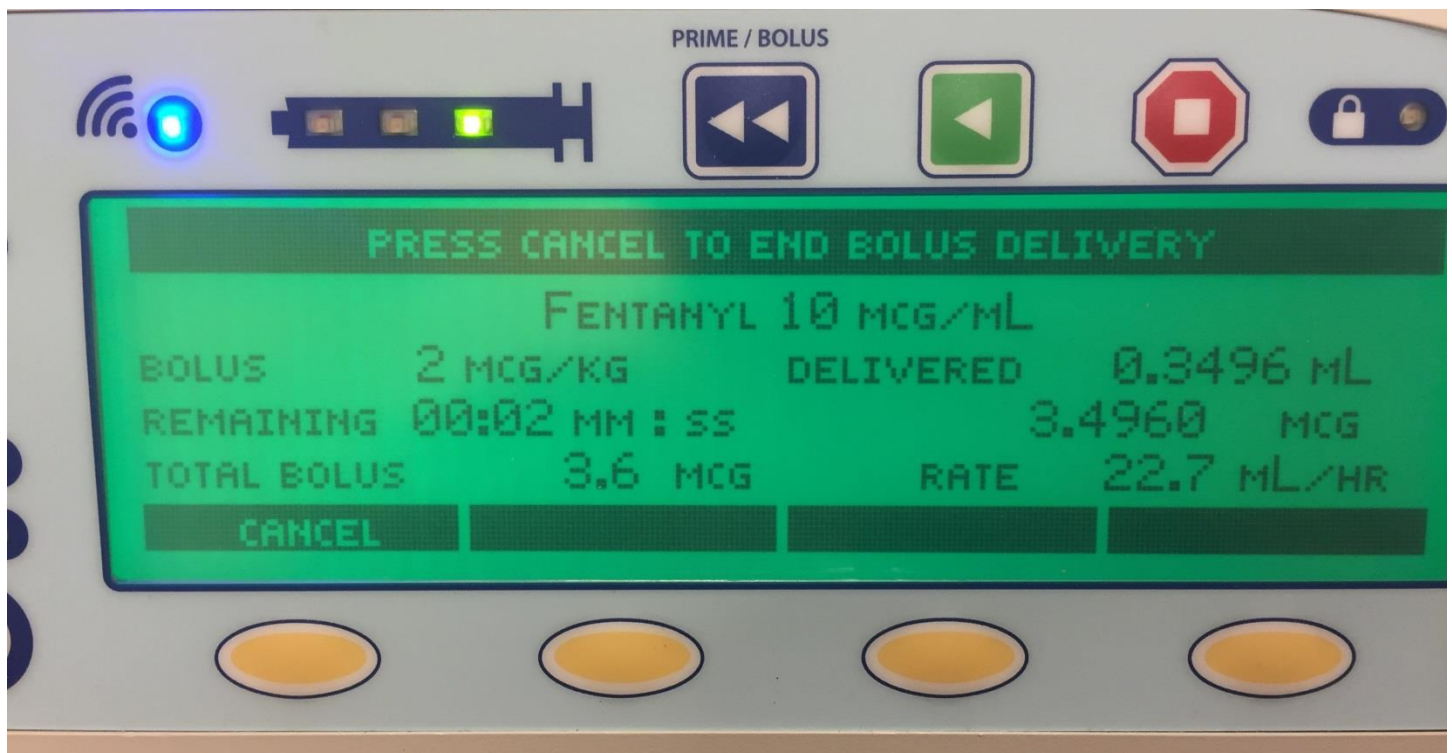
What I want: mcg

What I have: 2 mcg/kg ordered; weight= 1.8 kg; concentration: 250 mcg/25mL = 10mcg/1mL

$$\frac{mcg}{kg} \times \frac{kg}{1} = mcg$$

$$\frac{2mcg}{kg} \times \frac{1.8kg}{1} = 3.6 mcg$$

Verify if the indicated medication infusion pump is correctly programmed to administer the correct medication at the ordered bolus dose and with the correct concentration. Fent is given over 3-5 minutes to prevent chest wall rigidity



Example 3

You have an order for a **continuous** infusion of midazolam (VERSED) to run at 0.05mg/kg/hr. **Your patient weighs 2.25 kg**

The order is as follows :

Medication Order in EPIC

Midazolam (VERSED) 8 mg in D5W – 8 mL IV (PEDS)
Ordered Dose: 0.05 mg/kg/hr x dosing weight
Dosing weight: 2.25 kg

Once you have verified that the ordered concentration matches the concentration listed on the syringe label, calculate how many mL/hr will be delivered (the rate of the pump).

Use this formula:

What I want: mL/hr **What I have:** Ordered dose = 0.05 mg/kg/hr, Wt= 2.25 kg, Concentration= 8 mg/8ml = 1 mg/mL

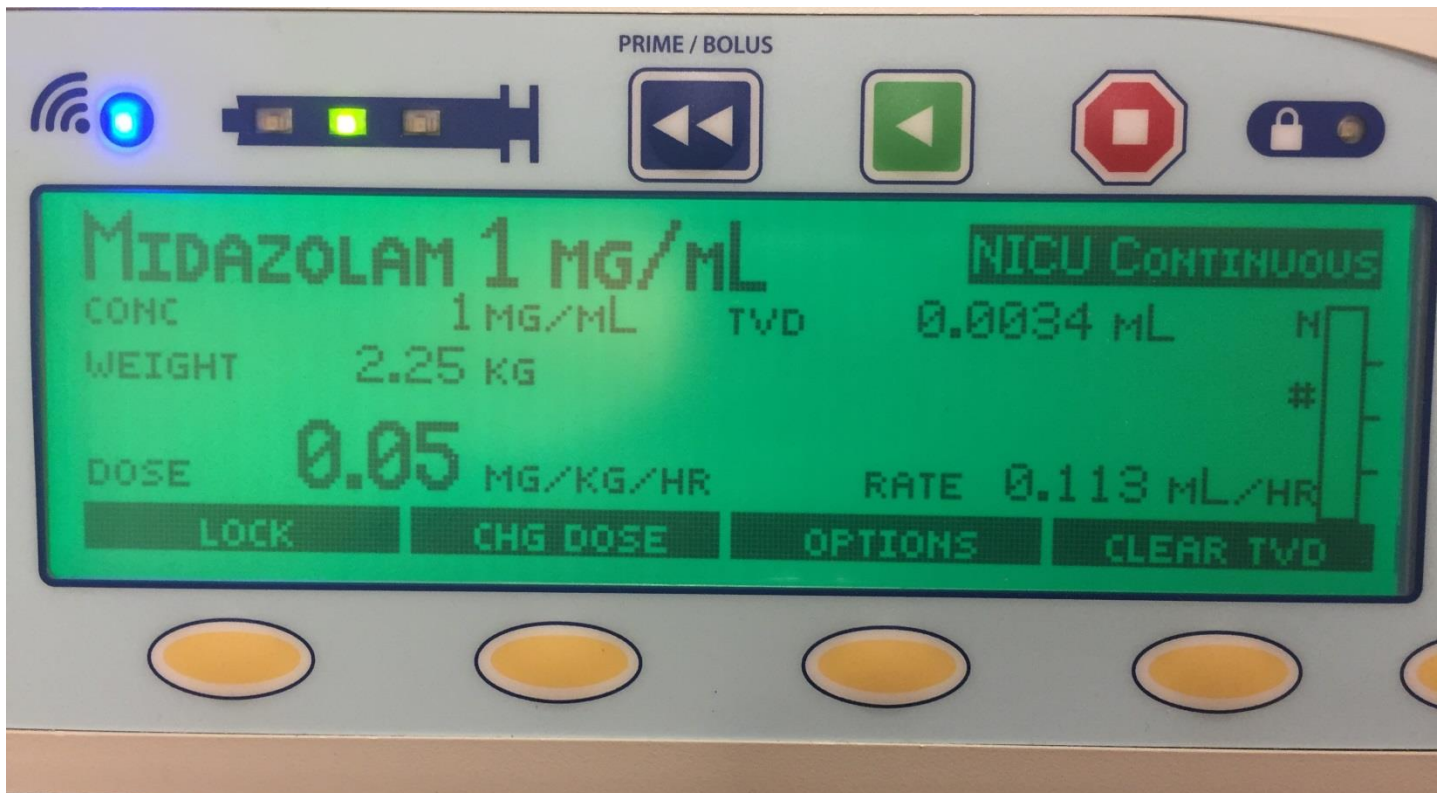
(dose) x (wt) x (concentration) = (Infusion Rate)

$$\frac{\text{mg}}{\text{kg/hr}} \times \frac{\text{kg}}{1} \times \frac{\text{mL}}{\text{mg}} = \text{mL/hr}$$

$$\frac{0.05\text{mg}}{\text{kg/hr}} \times \frac{2.25\text{kg}}{1} \times \frac{1\text{mL}}{1\text{mg}} = 0.113 \text{ mL/hr}$$



Verify if this medication infusion pump is correctly programmed to administer the correct medication at the ordered dose, at the correct rate, with the correct concentration, and the correct dosing weight.



Example 4

You have an order for a **continuous** infusion of Dopamine to run at 12 mcg/kg/min. **Your patient weighs 0.673kg**

The order is as follows:

Medication Order in EPIC

Dopamine 160mg in D5W - 50mL IV (PEDS)
 Ordered Dose: 12 mcg/kg/min x dosing weight
 Dosing weight: 0.673 kg

Once you have verified that the ordered concentration matches the concentration listed on the syringe label, calculate how many mL/hr will be delivered (the rate of the pump).

Use this formula:

What I want: **mL/hr**

What I have: Ordered dose = 12mcg/kg/min, Wt= 0.673kg, Concentration= 160 mg/50ml =3.2 mg/mL

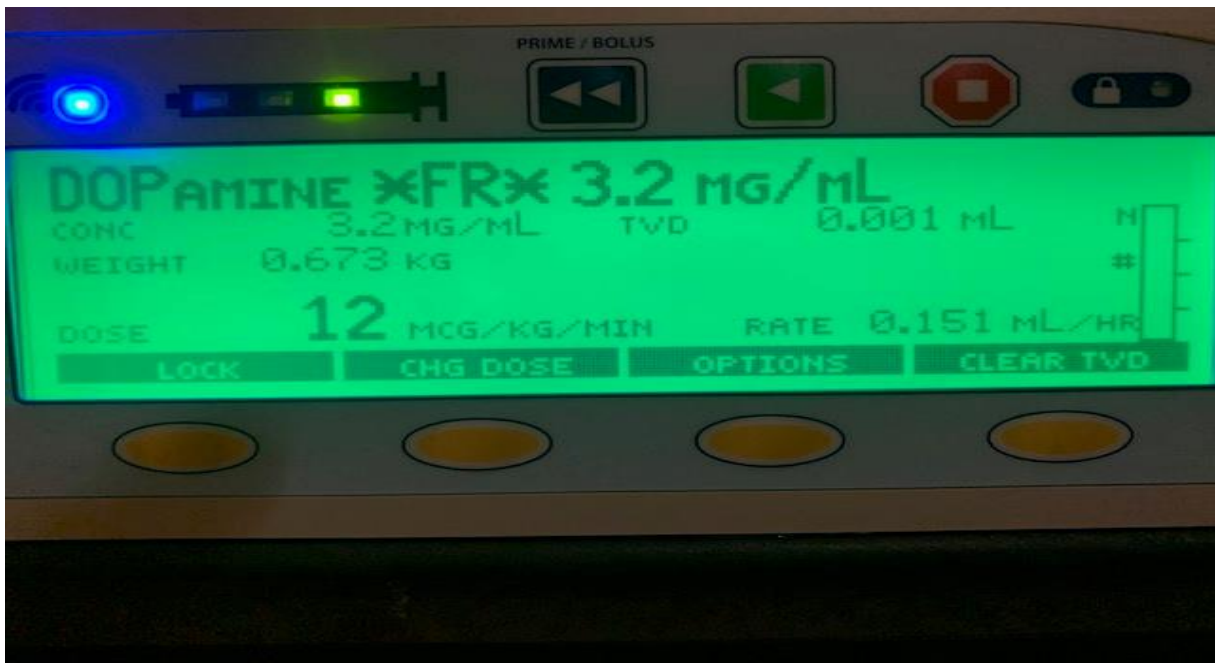
$$\begin{array}{ccccccc}
 \frac{\text{Mcg}}{\text{kg/min}} \times \frac{\text{kg}}{1} \times \frac{\text{ml}}{\text{mg}} \times \frac{60\text{min}}{1\text{hr}} \times \frac{1\text{mg}}{1000\text{mcg}} = \text{ml/hr} \\
 \uparrow \quad \quad \uparrow \quad \quad \uparrow \quad \quad \uparrow \quad \quad \uparrow \quad \quad \uparrow \\
 \text{(dose)} \quad \text{(wt)} \quad \text{(conc)} \quad \text{(conversion factors)} \quad \text{(TRA rate)}
 \end{array}$$

This is the same formula as: $\text{Dose} \times \text{Wt} \div \text{Conc.} \times 60 \div 1000 = \text{ml/hr}^$

$$\frac{12\text{mcg}}{\text{kg/min}} \times \frac{0.673\text{kg}}{1} \times \frac{1\text{ml}}{3.2\text{mg}} \times \frac{60\text{min}}{1\text{hr}} \times \frac{1\text{mg}}{1000\text{mcg}} = 0.151\text{ml/hr}$$

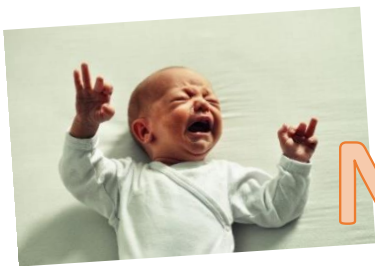
↑

(This fraction is the **concentration** of the med in that syringe. This concentration **CAN VARY** depending on order specification)



Neonatal Pain & Developmental Care





NEONATAL PAIN

What is Pain?

- An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Pain is always subjective
- the inability to communicate in no way negates the possibility that an individual is experiencing pain and needs appropriate pain-relieving treatment (Hummel, 2017)

Do all of our patients feel pain?

- Neonates over 24 weeks can perceive pain despite myelination not being complete
- How a patient perceives pain now can affect them later in life
- How pain is perceived: sensed peripherally by nociceptors → signal is transmitted to the spinal cord → fibers carry the impulse to the sensory cortex of the parietal lobe which interprets pain → pain also travels to the thalamic region and disseminated throughout the brain

How do Neonates respond to pain?

- Exhibit negative autonomic pain responses either physiologic, metabolic, hormonal, or behavioral

Responses to Pain	
Physiologic	<ul style="list-style-type: none"> • Increased heart rate • Heart rate variability • Bradycardia • Changes in respiratory rate or apnea • Fluctuations in blood pressure • Skin color changes
Metabolic or Hormonal	<ul style="list-style-type: none"> • Decreased oxygen saturation • Decreased vagal tone • Decreased peripheral blood flow • Palmar sweating • Nausea, vomiting, or dilated pupils • Increased intracranial pressure (with invasive procedures; may lead to intraventricular hemorrhage (IVH) or periventricular leukomalacia (PVL))
Behavioral	<ul style="list-style-type: none"> • Perspiration • Gastrointestinal (GI) disturbances

Responses to Pain	
Physiologic	<ul style="list-style-type: none"> • Increased cortisol level • Increased epinephrine level • Increased norepinephrine level • Increased growth hormone level • Decreased prolactin level • Decreased insulin level • Protein catabolism
Metabolic or Hormonal	<ul style="list-style-type: none"> • Decreased immune responses • Increased secretion of catecholamine, glucagon, and corticosteroids • Hyperglycemia
Behavioral	

Responses to Pain	
Physiologic	<ul style="list-style-type: none"> • Increased facial actions • Crying • Increased body movements • Irritability • Sleep disturbances • Sudden state change • Poor feeding
Metabolic or Hormonal	<ul style="list-style-type: none"> • Delayed wound healing • Developmental regression
Behavioral	

Do we cause our babies pain?

Unfortunately, yes...based on what procedures we are performing

Some of the most common painful procedures:

- Nasal/Tracheal suctioning
- Heel Sticks/Arterial punctures/Venipunctures
- Adhesive Removal
- Gastric Tube Insertion
- IV insertion/removal
- Chest Tube insertion/maintenance
- Wound Treatment
- Central line placement
- Venous/Arterial Umbilical Catheter insertion
- Bladder Compression/Foley
- Tracheal Intubation
- Subcutaneous or IM Injections



What is a stressor?

- Anything that causes physical or mental annoyance that disturbs the equilibrium of the neonate & its environment

Common stressors in the NICU:

- Nursing Care
- Noise/lights
- Oral suction
- Bathing/weighing
- X-rays
- Nasal Cannula Insertion
- Electroencephalogram
- Infant Massage
- Head Ultrasound/Abdominal Ultrasound/Echocardiogram



References

Hummel, P. (2017). Psychometric evaluation of the neonatal pain, agitation, and sedation (N-PASS) scale in infants and children up to age 36 months. *Pediatric Nursing*, 43(4), p175-184.

Neonatal pain. (2018). In *Clinical Skills*. Retrieved from <https://epm601.elsevierperformancemanager.com/Learning/Assignments.aspx?AssignmentStatus=CURRENT>

***LISTEN* to WHAT I'M TELLING YOU**

READING BEHAVIORAL CUES

Physiologic/ autonomic (Automatic Functions)

- Color changes - pallor or flushing
- Changes in vital signs (e.g. Heart rate, breathing)
- Hiccups
- Spitting up
- Sneezing
- Yawning

State subsystem (States of consciousness)

- Irritability
- Diffuse sleep states
- Grimacing
- Twitching
- Glassy eyes
- Gaze aversion
- Staring
- Panicked look

Motor subsystem (Muscle Movements)

- Hyperextension of extremities - saluting, arching, airplane, sitting on air, "stop" sign
- Frantic movements
- Finger splaying
- Generalized hypotonia - low muscle tone



Supporting Disorganized Infants or Infants in Pain

Support regulation:

- Guide infant's hands together at midline, to face, to mouth
- Swaddling, boundaries
- Caregiver hand at midline
- Gentle, firm touch
- Averting your own gaze if needed
- Support for non-nutritive sucking (pacifier, oral sucrose when needed)
- Soothing voice
- Facilitated tucking/containment hold (help baby curl up in fetal position)
- ENVIRONMENTAL MODIFICATION
- WAIT for infant to indicate that HE/SHE is ready... be patient!! (Bright steady eye contact, relaxed body, etc.)



Pain Management- Tip Sheet

Non-Pharmacologic Pain Interventions

- Swaddling, facilitated tucking of non-affected limbs.
- Reduction of environmental stimuli
- Utilization of parents for holding and consoling.
- If infant does not qualify for oral sucrose, can use swab of breast milk with pacifier.
- Oral Sucrose Administration Tips:
 - o 27-31 weeks gestation: 0.2 ml - 0.5 ml orally per procedure
 - o 32-36 weeks gestation: up to 1 ml orally per procedure
 - o >37 weeks gestation up to 1 month of age: up to 2 ml orally per procedure
 - o **Used for pain-producing procedures- not to console crying/fussy infant.** If you feel your patient is in pain in the absence of a painful procedure, consult medical team for management.
 - o **Exclusion** for oral sucrose:
 - Hyperglycemia
 - Cardio/respiratory instability
 - < 27 weeks
 - Vented patients
 - **NPO**
 - **GI dysfunction/abnormalities/surgeries**
 - Patients at increased risk for NEC: HIE, feeding intolerance, no bowel sounds, CHD

Pain/Sedation Documentation

- Vitals should accompany all N-PASS scores
- Sedation scoring for patient's receiving sedative medications q hands-on assessment.

Assessment Criteria	Sedation		Normal	Pain / Agitation	
	-2	-1	0	1	2
Crying Irritability	No cry with painful stimuli	Moans or cries minimally with painful stimuli	Appropriate crying Not irritable	Irritable or crying at intervals Consolable	High-pitched or silent-continuous cry Inconsolable
Behavior State	No arousal to any stimuli No spontaneous movement	Arouses minimally to stimuli Little spontaneous movement	Appropriate for gestational age	Restless, squirming Awakens frequently	Arching, kicking Constantly awake or Arouses minimally / no movement (not sedated)
Facial Expression	Mouth is lax No expression	Minimal expression with stimuli	Relaxed Appropriate	Any pain expression intermittent	Any pain expression continual
Extremities Tone	No grasp reflexes Flaccid tone	Weak grasp reflex ↓ muscle tone	Relaxed hands and feet Normal tone	Intermittent clenched toes, fists or finger splay Body is not tense	Continual clenched toes, fists, or finger splay Body is tense
Vital Signs HR, RR, BP, SaO₂	No variability with stimuli Hypoventilation or apnea	< 10% variability from baseline with stimuli	Within baseline or normal for gestational age	↑ 10-20% from baseline SaO ₂ 76-85% with stimulation - quick ↑	↑ > 20% from baseline SaO ₂ ≤ 75% with stimulation - slow ↑ Out of sync with vent

Frequency:

- Every set of vitals
- With every known painful event/ procedure
 - o Painful procedures have unique charting for each event
- With change in patient condition: Patient on fentanyl drip has change in vitals/ other signs of pain.

- Follow up from recorded pain/ pain intervention- Until N-PASS reflects a desired level of pain for the patient condition. Score of 3 or less is acceptable post intervention
 - o PO medication/ non-pharmacologic intervention: reassess in 1 hour
 - o IV med: reassess in 30 min

Other Tips

- Tylenol is a standard order for administration prior to circumcision.
- LMX cream prior to LP (only use if ≥ 36 weeks)

Guidelines for: Skin to Skin Care in the NICU

Purpose: To provide an evidenced-based standard guideline for Skin to Skin care (Kangaroo Care) in the Comer NICU, Comer TCU, and Mitchell TCU.

Definitions (if applicable):

Developmental Care: Care techniques and interventions designed to promote optimal neurodevelopmental outcomes in the neonate. Developmental care aims to reduce environmental stressors, increase awareness of infant's behaviors, and relies heavily on integration of parents/caregivers into daily routines and care.

Family Centered Care: Family centered care is a healthcare philosophy in which the planning, delivery and evaluation of care is based on mutually beneficial partnerships between healthcare providers, patients, and patients families. Family centered care acknowledges that families are integral parts of the healthcare team and heavily influence the social, emotional, and developmental well-being of a patient.

Kangaroo Care: Kangaroo care is a form of skin-to-skin contact between an infant and caregiver in which that infant is held in the upright position on the caregiver's bare chest. Kangaroo care decreases infant heat loss through minimization of exposed skin surface and promotes conductive heat gain through skin-to-skin contact.

Skin to Skin Care: Skin to skin is a general term that encompasses the direct interaction between infant and caregiver in which the unclothed infant lies directly on the bare chest of the caregiver. Reported benefits include increased stabilization of vital signs, increased thermoregulation, increased likelihood of breastfeeding, improved growth, shortened length of stay, increased neurobehavioral maturation, and better pain management routines.

Criteria/Indications:

- Clinically stable infants
- Mother's having difficulty established milk supply
- Mother's having difficulty maintaining milk supply
- Promotion of infant-parent/caregiver bonding
- Incorporation of parents/caregiver as active participant in care of the infant

Contraindications: The following conditions are contraindications to Kangaroo care. For the following conditions, the initiation of Kangaroo care will be at the discretion of the healthcare team:

- Infants with suspected PPHN or PPHN diagnosis
- Infants with arterial lines
- Infants with gastroschisis/omphalocele that has not been fully reduced
- Infants receiving vasopressors
- Infants receiving whole body cooling
- Infants with open wounds/immediate post-op period
- Infants with acute cases of NEC
- Infants on HFOV

Procedure:

- Parents should be encouraged to wear button down shirts or the Nu-roo Pocket. **See Appendix A.**
- Kangaroo care should be performed for a **minimum** of 1 full hour to organize sleep and promote brain development for their infant.

PRIOR TO TRANSFER

1. Document baseline assessment, including vital signs and respiratory support (if temp less than 36.6°C infant must be warmed in isolette before transfer). Be aware of the infant's neurobehavioral stability.
2. Assemble any needed equipment and additional staff as needed.

3. Place recliner next to patient bedside.
4. Undress infant, change diaper, place head cap, and place folded blanket under infant.
5. Ensure that all physiological parameters are returned to baseline before placing infant on the caregiver for skin-to-skin.

TRANSFER

1. Gather and free all lines by incubator door.
2. Carefully move and place infant vertically onto the caregiver's chest.
 - a. If infant is intubated, use another RN or RT to assist with moving infant. Patient RN then moves infant to caregiver's chest.
 - b. Secure ventilator tubing and auscultate for bilateral breath sounds to ensure adequate ET tube placement.
3. Cover infants back with caregiver's shirt or 1 to 2 blankets.
4. Infant's extremities should be well-flexed with head/neck maintained in sniffing position.
5. If the infant has a skin temperature probe on, leave it on and set isolette to air control mode to maintain appropriate neutral thermal environment.
6. Place recliner foot rest in elevated position
7. Document vital signs and respiratory support. Monitor for changes from baseline assessment and neurobehavioral stability.
 - a. Take infant's axillary temperature after 1 hour of skin-to-skin
 - b. If infant's temperature has decreased more than 0.5°C, infant should be returned to isolette.

REVERSE TRANSFER

1. Put recliner in upright position
2. Move patient and all lines from the parent's chest and place infant in incubator in supine position
 - a. If infant is intubated, use another RN or RT to assist with moving infant.
 - b. Secure ventilator tubing and auscultate for bilateral breath sounds to ensure adequate ET tube placement.
3. Reset incubator to patient control.
4. Monitor infant's vital signs until they return to pre-Kangaroo Care baseline.
5. Encourage lactating mothers to pump after Kangaroo care because of its stimulating effect on milk production.

Potential Complications:

- Unplanned extubation
- Clinical deterioration in patient status
- Unplanned line migration

Cross Reference to the Following Hospital Policies (if applicable):

Interpretation, Implementation, and Revision:

References:

Altimier, Leslie, Brown, Beth & Tedeschi, Laurie (2011) NANN Guidelines for nursing policies, procedures, competencies, and clinical pathways. Glenview, IL: NANN 288-290, 526

Kenner, Carole & J.M. McGrath (2004) Developmental care of newborns & infants, a guide for health professionals. St. Louis, MO: Mosby

Kenner, Carole & J. Wright Lott (2004) Neonatal nursing handbook. St. Louis, MO: Saunders 427-429

Lehtonen, L. (2015). Assessment of optimization of neurobehavioral development in preterm infants. In A. A. Fanaroff & R. J. Martin (Eds.) Fanaroff and Martin's neonatal-perinatal medicine diseases of the fetus and infant. Philadelphia, PA: Elsevier/Saunders.



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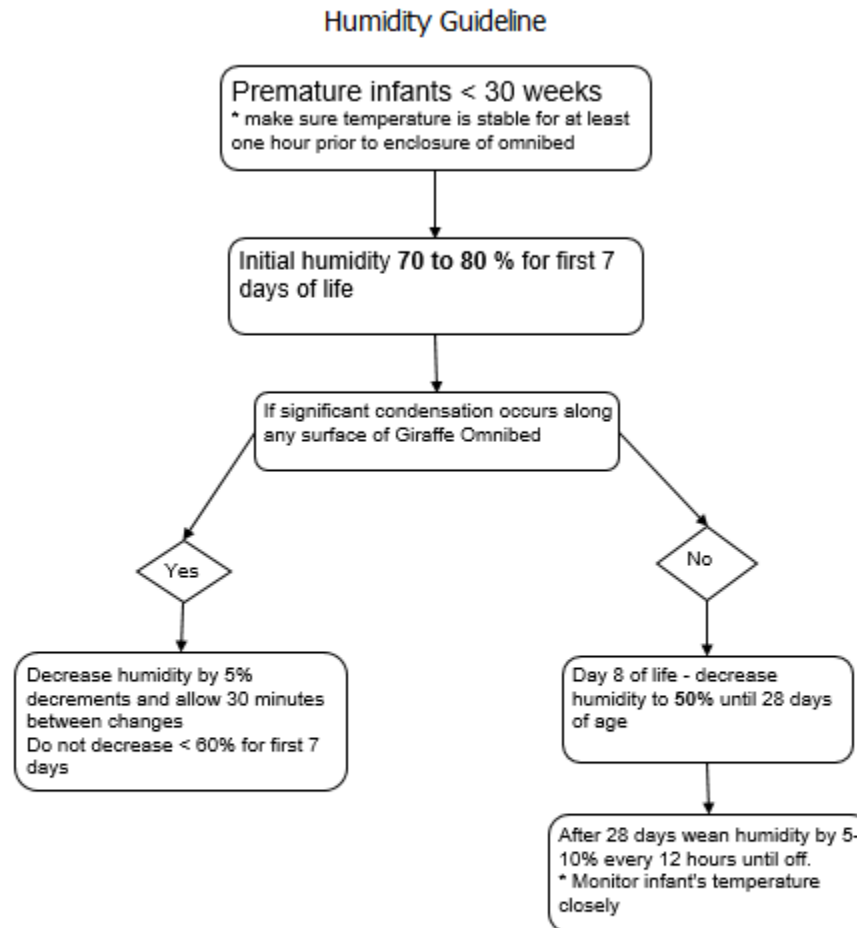
IVH Prevention Nursing Bundle

72 Hour IVH Protocol

PURPOSE: To provide developmentally appropriate care to preterm infants <30 weeks gestational age, and reduce the risk of intraventricular hemorrhage (IVH).

- ✚ Upon admission to the NICU, infants only require hands-on assessments every 6 hours. This includes clustering care with medical and interdisciplinary care providers
- ✚ During diaper changes, carefully move infant side to side with minimal lifting of legs
- ✚ Maintain midline position with head and shoulders in alignment during supine and side lying positioning.
- ✚ Minimize suctioning for medical indications only
- ✚ Keep head of bed flat
- ✚ Use developmental positioning aids (bendy bumpers, frogs, rolled up linens) (but NO z-flows)
- ✚ For patients placed on polyethylene wrap, temperature must be stabilized in a humidified environment for 60 minutes prior to careful removal.
- ✚ No bath, lotions, or linen changes
- ✚ No non-invasive blood pressure when arterial line is present. Avoid the use of tight phototherapy masks (use the rim of a hat and the phototherapy goggles)
- ✚ Avoid rapid flushes unless indicated in an emergency
- ✚ Flush arterial lines in a gentle, pulsatile motion.

Humidity Guidelines



**Infants less than 30 weeks have an underdeveloped stratum corneum which allows for heat and water loss. Humidity helps with decreasing transepidermal water loss, fluid and electrolyte balance and aids in skin barrier maturation.
Reference:
Evidence-Based Clinical Practice Development Team (2007), *Neonatal Skin Care Evidence-Based Clinical Practice* 2nd Edition, Association of Women's Health Obstetric and Neonatal Nurses

CHG Bathing in the NICU*

*at this time, we are only using CHG wipes on full term infants prior to surgery, all other infants are evaluated on a case by case basis

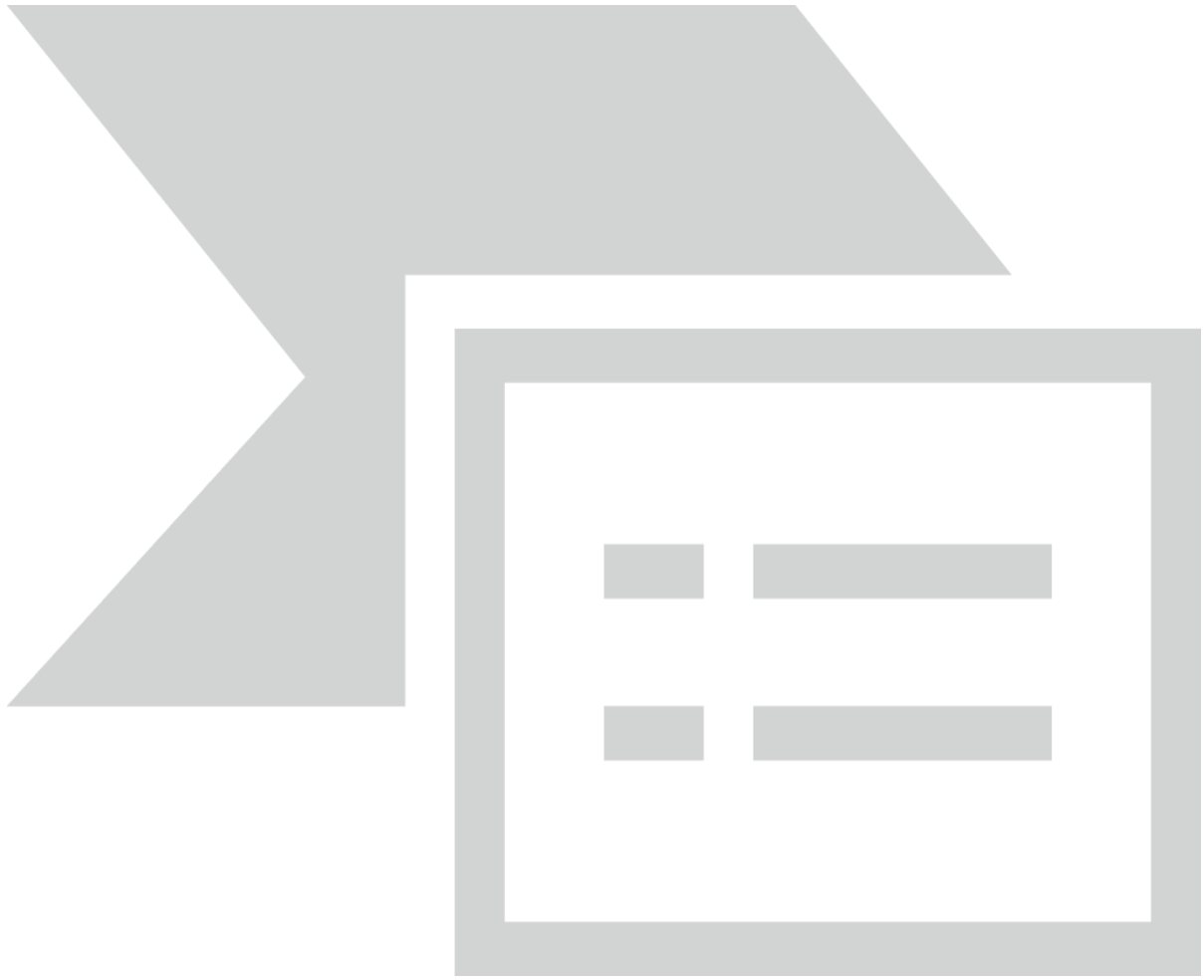
IF YOUR PATIENT QUALIFIES FOR A CHG BATH:



- ✚ CHG wipes are stocked on the unit, and should be kept in the wipe warmer
- ✚ ALWAYS REMEMBER: the site around the line gets cleaned first
- ✚ Provide CHG Treatments prior to central line dressing changes







**University of Chicago Medical Center
Neonatal Intensive & Intermediate Care Units
Ohmeda Bilimeter**

Why should you perform bilimeter reading?

To assure that patients receive therapeutic doses of phototherapy, all phototherapy units must be measured for irradiance.

Equipment:

Ohmeda bilimeter

Procedure:

1. Remove the meter from its cover.
2. It is necessary to calibrate the meter prior to its use.
 - Switch the meter to on. Position *with the black cap in place*. 0.0 or 0.1 uW/cm²/nm is an acceptable reading.
3. To measure irradiance of bank lights or overhead lights, remove the cap and place the meter at the level of the infant's mid-section. Do each light individually.
4. The black button on the right side of the meter can be depressed in order to hold a reading.
5. Document finding in flowchart. To be done at least once per shift. To measure the irradiance of the fiber optic biliblanket:
 - A) Place the meter over the blanket.
 - B) Obtain a separate reading for 5 sections of the blanket plus the middle.
 - C) Get the average of the 6 readings to obtain the whole number.

What should the Bilimeter Read?

Type of Phototherapy	Distance from Patient.	Expected Irradiance
Biliblanket	Bilimeter on blanket	30-35 uW/cm ² /nm
Photo-Therapy 4000 Blue Lights	15- 20 inches from Pt.	17 uW/cm ² /nm
Spot (Ohmeda)	20-35 inches from Pt.	8-30 uW/cm ² /nm
Spot (Giraffe)	23-24 inches from pt. with a 29 cm diameter	30 uW/cm ² /nm

References:

- GE Helathcare.com *Putting the SPOT light on phototherapy, Ohmeda & Giraffe Spot light*
- Drager Medical Manuel pg 21
- Reviewed by Fernando Maturall, NICU Clinical Engineering

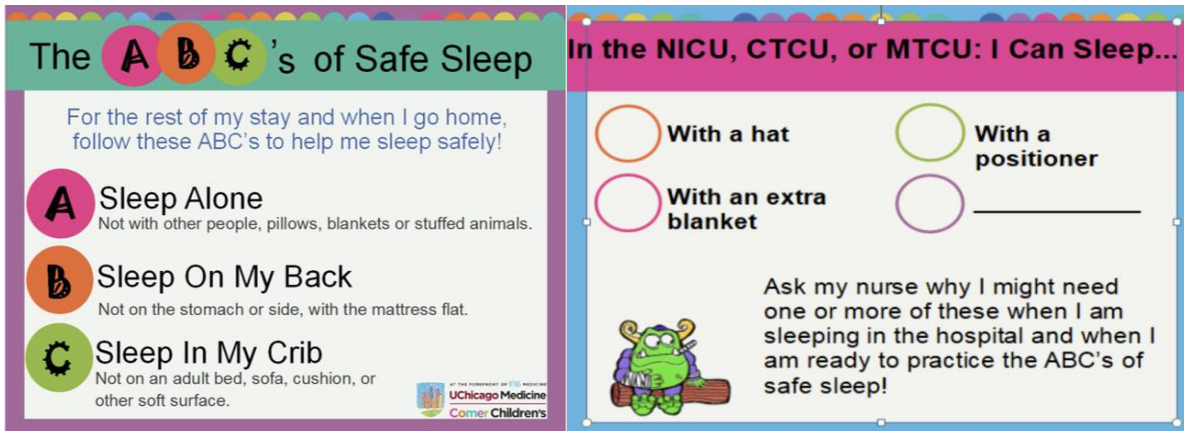
Safe Sleep in the NICU

Who Qualifies?

- 34 weeks CGA and clinically stable.
- Begin the transition to safe sleep by placing infant supine and flat for all sleep at **32 weeks** CGA, and clinically stable.

What Changes Occur in the Sleep Environment?

- Safe Sleep card reviewed with parents and placed at bedside.



- Infant placed supine with head of bed flat- unless modification is ordered.
- Bedding: ONLY a fitted crib sheet, sleep sack or one swaddle blanket for infant.
- Infant can wear one sleeper or t-shirt under sleep sack/ swaddle
- Positioners only used if ordered.
- No extras in the bed: stuffed animals, fluffy blankets, medical equipment.
- Parent Education initiated prior to starting safe sleep/ well in advance of discharge.
 - Get Well Network video.
 - Safe sleep pamphlet handed to parents and added to discharge paperwork.

What Is Documented?

- Charting in EPIC is completed with every assessment if patient qualifies for safe sleep.

The screenshot shows the EPIC EHR interface for a patient in the NICU. The 'Safe Sleep Documentation' checklist is expanded, showing various items with checkboxes. The item 'Is newborn swaddled in crib' is checked, but the response is 'NO'. A red box highlights this row, and a callout box points to it with the text: "Do not continue to document if you answered 'NO' to this question".

Other Tips

- Co-sleeping (parents sleeping with infant) is never safe or appropriate.
- Infants with reflux: Elevation of head of bed is not recommended- Keeping infant vertical for 15-30 min post feed is best.

University of Chicago Medical Center
Neonatal Intensive & Intermediate Care Units
Breastfeeding Basics

Advantages of breast milk for the premature infant:

- 1) Breast milk is specific for the needs of the preemie; composition is specific for the gestational age.
 - Levels of nitrogen, proteins, fatty acids, sodium, chloride and iron are higher in pre-term breast milk.
 - Volume and calories remain the same when compared to term milk.
- 2) More easily digested
 - Evidence shows lower risks for necrotizing enterocolitis.
- 3) Infant has lower levels of water loss leading to more capabilities of thermoregulation.
- 4) Protects against infection.
- 5) Better for neurological development.
 - Cholesterol, which is necessary for brain development is present in breast milk but not in formula.
 - Retinal development is improved due to the presence of long-chain fatty acids found in breast milk.
- 6) Respiratory function is more stable when comparing breastfeeding to bottle feeding.
 - Studies have shown that when babies are ready to actively feed, fluctuations in tissue oxygenation of breastfed infants were less.
 - Aspiration of breast milk is less irritating and less likely to occur.

Nutritional support for breastfeeding/pumping mothers:

- 1) Drink to thirst.
- 2) Continue to take prenatal vitamin or some kind of multivitamin.
- 3) Increase your total calories by 500 to 700 additional calories/day (average person uses 500 calories for milk production).
- 4) Snack often.

Pumping instructions for mothers:

- 1) Begin pumping as soon as able to. Ideally within 6 hours of delivery.
- 2) Always wash hands thoroughly with soap and water before handling the breast, pump, and attachments.
- 3) Pump both breasts every 3 hours, with one pumping session being during the middle of the night, for a total of 8 pumping sessions, for 10 -15 minutes each session.
- 4) Do not go longer than 5 hours between pumping. (Drained breasts make milk faster, full breasts make milk slower).
- 5) Have a picture of baby and a blanket or piece of clothing from baby when pumping at home. This will help improve letdown.
- 6) Provide kangaroo care whenever possible.
- 7) Ask RN how much baby is taking per feeding. Try to store approximate to that amount per container and bring it to the NICU.

RN instructions:

- 1) Store, thaw, warm, administer, & label breast milk/formula according to Breastfeeding policy N1450G.



Goal: 8 or More Pumps in 24 hours

Initiating breastfeeding:

Feeding is the most highly organized behavior of infants. It becomes the most complex skill NICU babies need to achieve in order to go home.

- 1) It may take several attempts to successfully achieve a proper latch.
- 2) Fetal oral development
 - a) swallowing at 11-12 weeks gestation
 - b) suck reflex at 24 weeks
 - c) gag reflex at 24 weeks
 - d) Rooting/suck/swallow by 32 weeks(attempt to initiate breastfeeding as soon as clinically indicated)
 - e) Suck/swallow/breathing fully coordinated by 37 weeks
- 3) Create a supportive environment for mom and baby. Calm with few as distractions as possible.
- 4) Use a slow-flow nipple when bottle feeding is necessary.
 - Slow-flow nipples are indicated for: Premature infants, breast & bottle infants, chronic lung disease infants.

Breastfeeding positions

* Cradle



* Football



Side-lying



* Preferred for NICU patients

References:

- Lott, Kenner (2004) *Neonatal Nursing Handbook*. Saunders. Dalles, TX 317-320
- Merenstein, G. & Gardner, S. (2006) *Handbook of neonatal Intensive Care, 6th edition*. Mosby. St. Louis, MO 469-507
- Prepared Childbirth Educators, INC. Breastfeeding Program
- Abbott Nutrition DVD: Supporting Better Feeding Outcomes
- Reviewed by Julie Lester LC and Janet Sherdan LC

Breast Milk & Prepared Formula Storage and Expiration

Type	Storage	Expiration	Comments
Fresh breast milk	Kept at infant's bedside at room temperature	Expires after 4 hours	
Fresh breast milk	Kept in refrigerator	Expires after 96 hours.	Encourage mothers to freeze milk if it will not be used within the first 96 hours
Frozen breast milk	Solidly frozen in NICU & TCU freezers	Expires after 6 months.	For short distance transport, milk should be packed tightly in a cooler on freezer gel packs.
Thawed breast milk	Thawed milk that has not been warmed	Expires after 24 hours. Do not refreeze	<p>Frozen milk should be thawed in the order it was expressed (oldest expressed date should be thawed first)</p> <p>Thawing should never be done in a microwave oven or hot water</p> <p>Frozen human milk may be thawed:</p> <ol style="list-style-type: none"> 1. Gradually by transferring milk to the refrigerator 2. Rapidly by utilizing milk warmers. <p>Frozen milk must be fully thawed to prevent loss of nutrients and to minimize excessive bacterial growth.</p>
Fortified breast milk	In the refrigerator	Expires after 24 hours	
Warm breast milk (un-fortified or fortified)	<p>Use milk warmers at bedsides</p> <p><i>*If no warmer available:</i> Place container in a plastic pitcher liner partially filled with warm water. If milk is in a syringe, place syringe in a glove. Do not immerse containers or syringes underwater</p> <p>Warming should occur on the patient's bedside counter</p>	Expires after 4 hours (includes the 15 minutes used to warm)	<p>Do NOT warm breast milk in patient isolette, in hot or boiling water, or in microwave</p> <p>Warming time should be limited to no more than 15 minutes</p> <p>Human milk need only be warmed to body temperature (37C or 98.6F)</p>
Hospital prepared formula	<p>In bedside refrigerator</p> <p>Same warming procedure as breast milk</p>	Expires after 24 hours	Same guidelines as for breast milk

Formula/Breast milk Administration

- ❑ For intermittent feeds by feeding or syringe pump, change the syringe and tubing for every new feeding
- ❑ For continuous NG feeds, change the tubing, syringe, and **formula or breast milk** every **4 hours**
- ❑ All syringes must be labeled with the feeding (formula/breast milk) type, patient name, date, and time.
- ❑ When using a syringe pump to administer breast milk via NG, the feeding or syringe pump should be **UPRIGHT** (vertical) with the plunger towards the floor to enhance breast milk fat delivery. **This is true for both continuous feeds AND bolus feeds!**

	4°	24°	96°
Tubing Change (CNG) Breastmilk and Formula	X		
How long is thawed or Fortified Breastmilk good?		X	
How long is refrigerated Fresh Breastmilk good?			X

References

UCM hospital Policies:

- ORO/Gastric, Gastrostomy, Jejunum Tube feeding PC112
- Collection, Storage, and Administration of Breast Milk 1450G
- Nutrition Formula Room ICO-18 2012

Robbins, Sandra T., & Meyers, Robin (2011). Infant Feedings: Guidelines for preparation of human milk and formula in health care facilities. *American Dietetic Association*, 2nd Edition. 83-84, 98-99

COMER FORMULA ROOM GUIDE

Phone 58706 or 52311 / Pager 5689

Hours and Delivery Times

Hours: 9 AM to 5:00 PM daily

Delivery Times:

-1 **pm** for reoccurring formula orders and new formula orders placed before **10:30 AM**

-**5:30 pm** for reoccurring daily fortifiers and new orders placed before **4:15 pm**

Other:

-Please use appropriate **substitutions** when available until delivery times

-Please call or page (58706/5689) for **STAT orders**, will be delivered within 2 hours of communication

-Please call or page for new order placed after cut-off time of **4:15 pm** for **5:30 pm** delivery

-If patient is **NPO** in EPIC formula will NOT be made unless there is an MD order and RN communication regarding need for formula

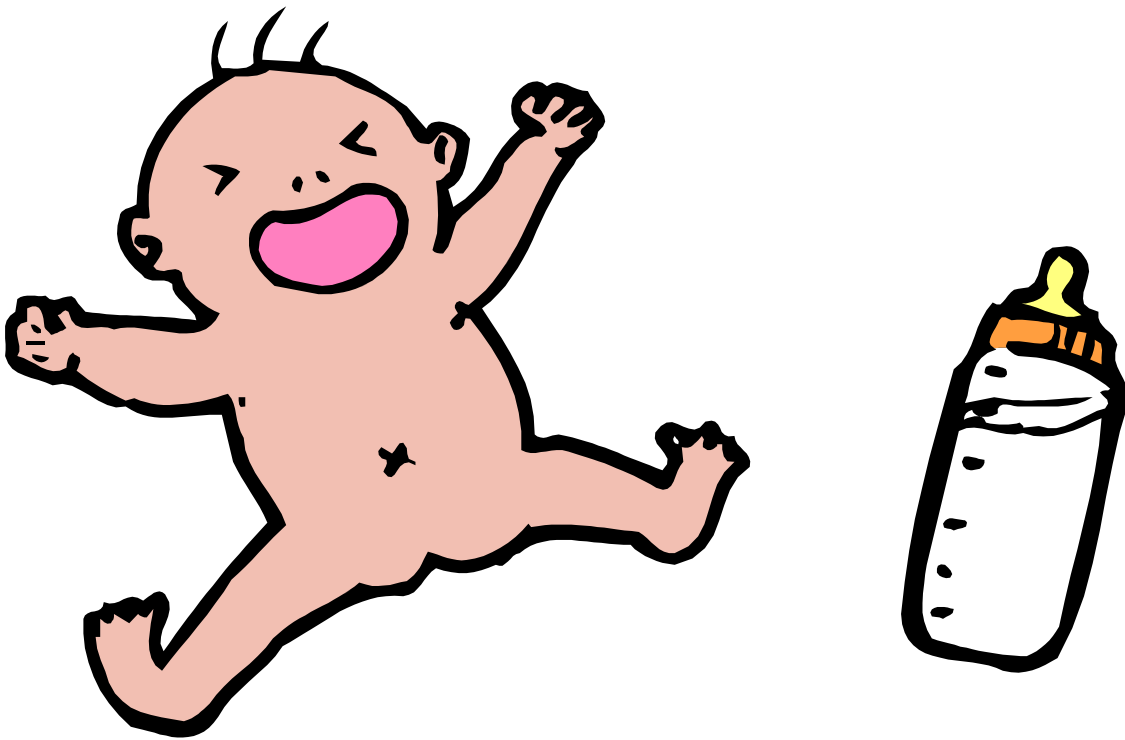
Products Prepared by Formula Room

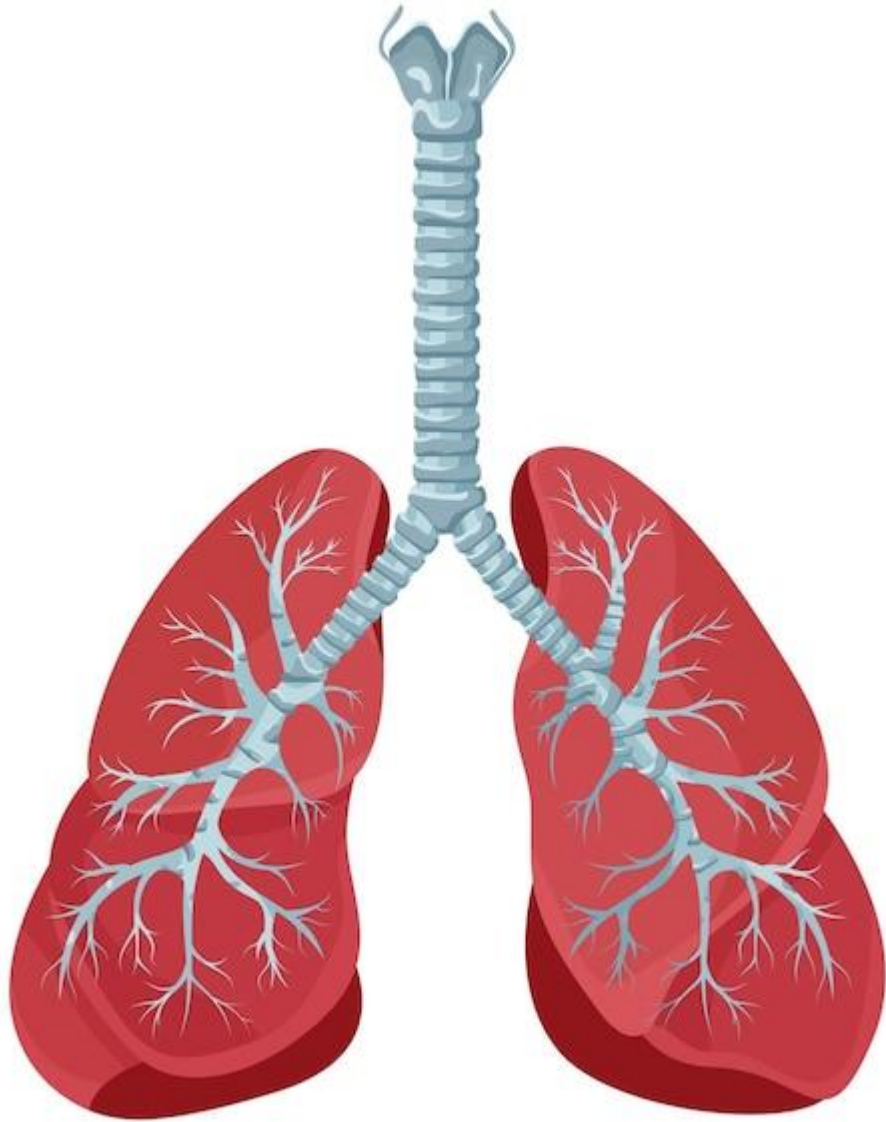
- Elecare – all calorie level
- Elecare Jr – all calorie level
- Enfamil AR – 20,22,24 kcal/oz
- Enfamil Enficare – 24,27,30 kcal/oz
- Enfamil Gentlease – 22, 24, 27, 30 kcal/oz
- Enfamil Premium Infant – 27,30 kcal/oz
- Enfamil Prosobee – 22,24,27,30 kcal/oz
- Enfaport – all calorie level
- Similac Soy (Isomil) – 22,24,27,30 kcal/oz
- KetoCal 3:1 and 4:1 – all calorie level
- Neocate Infant – all calorie level
- Neocate Splash/Jr – all calorie level
- Nestle Good Start Essentials, 22, 24, 27, 30 kcal/oz
- Pregestimil – 27,30 kcal/oz
- Similac Advance- 27, 30 kcal/oz
- Similac Alimentum – 22,24,27,30 kcal/oz
- Similac Neosure – 24,27,30 kcal/oz
- Similac PM 60/40 – all calorie level
- Liquid Protein Fortifier
- Powdered human milk fortifiers -
(Neocate/Neosure/Pregestimil)
- Similac Concentrate human milk fortifiers
- Vivonex Pediatric – all calorie level

After Hours Procedure

1. Substitute with a **Ready to Feed (RTF)** formula from **Central Supply** at a **lower calorie level** or alternate, comparable brand if appropriate (see **Infant Formula Substitution List**)
- Formulas with no substitution have kits for preparation overnight stocked in Comer 6 and PICU nourishment rooms and the CTCU medication room. There are kits for the following formulas: Elecare infant – 20 kcal
 - Elecare Jr – 30 kcal
 - Enfamil AR – 20 kcal
 - Enfaport – 30 kcal
 - Vivonex Pediatric 20 kcal
 - Ketocal 4:1 – 45 kcal
 - Neocate Infant – 20 kcal
 - Neocate Splash – 30 kcal
 - Similac PM 60/40 – 20 kcal
 -

*If overnight calorie concentration is not acceptable notify MD/NNP. Please call **52311**, and leave a message regarding STAT formula to be prepared in the morning.





Respiratory

Apnea, Bradycardia & Oxygen Desaturations in the NICU

What is Apnea?

- **Definition: cessation of the respiratory airflow**
- **There can be different types of apnea!**
 - **Central Apnea: absence of inspiratory effort**
 - **Obstructive Apnea: inspiratory efforts occur, but are ineffective in the presence of an upper airway obstruction**
 - **Mixed Apnea: central apnea occurs initially followed by an upper airway obstruction with inspiratory efforts preceding or following central apnea**
 - **Parameters: Apnea for >20 seconds**

What is Bradycardia?

- **Definition: heart rate below the normal range for age**
- **Parameters: Heart rate <80 bpm for 10 continuous seconds while infant is at rest**

What is Desaturation?

- **Parameters: O₂ saturation <90% for more than 10 continuous seconds or determined by monitor profile selected based on patient**

Apnea & Bradycardia	
<input type="checkbox"/> Apnea	No
Seconds of Apnea	
<input type="checkbox"/> Bradycardia	Yes
Lowest HR	76
Seconds of Bradycardia	12
<input type="checkbox"/> Desaturation	No
Desat	
Duration of Desaturation	
Skin Color	Pink
Interventions	Gentle stimulat...
Activity During Episode	Quiet Awake
Response to Interventions	Return to initial...
<input type="checkbox"/> Provider notified?	No
Provider Name	

(SAMPLE DOCUMENTATION)

Intubation/ETT Securement:

MDs/NNPs, fellows, and residents are able to perform intubations in the NICU/CTCU/MTCU. If the need for intubation was not planned, you may not be able to leave the bedside to obtain supplies if you need to hand-ventilate the infant with the bag and mask. In this case, ask one of your co-workers to get a doctor or NNP, grab the intubation "box" (located in the alcoves between pods) and to "cut tapes" for you (although you should have appropriately sized tapes at the bedside at all times). If no one is readily available, just hit your red Staff Assist button found on the wall of each bed space and team members will come running!

Intubation Kit Contents:

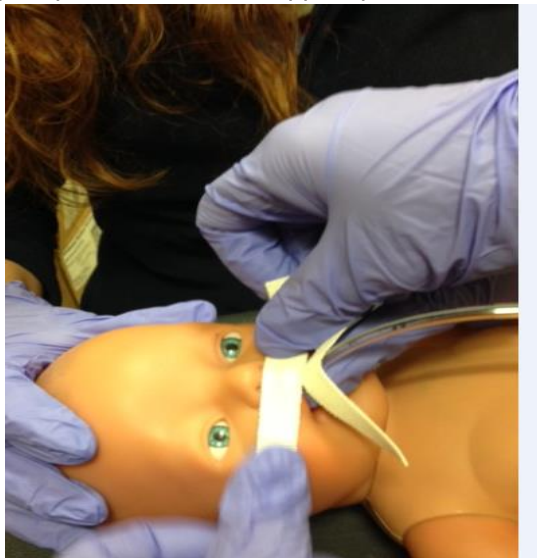
- One disposable handle
- One of each size blades (00, 0, 1)
- Three each ETT size (2.5, 3, 3.5, 4)
- Two stylets
- Two benzoin
- One pediacap (CO2 detector)

Securing the ETT

- Place Duoderm under the tapes. We cut the Elastoplast tape into 3 strips: one "H" and two "Y's." Make sure you cut them the "stretchy" way!



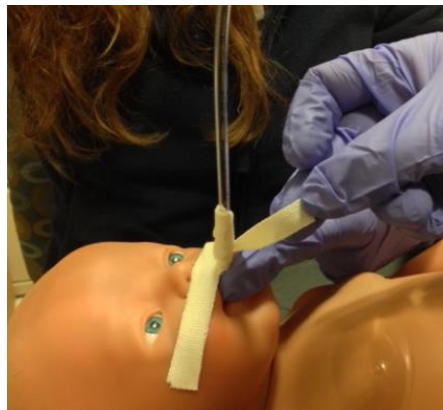
- The "H" is placed with the top strip over the infant's upper lip, stretched out fairly tight directly across the cheeks.



- The bottom strip will then have half of itself hanging over each side of the tube. Wrap one side of the strip over and around the ETT, angling each wrap slightly upward as you go. Make sure your first wrap around the ETT is as close to the lip as possible so there are no gaps visible. Any visible gaps will allow “tromboning” later.



- Next wrap the other side in the same manner. Take one of the “Y”s and place the uncut side on one side of the face, on top of the “H” already placed on the cheek. The top strip of the “Y” will be stretched over the lip and over onto the opposite cheek (again, on top of the tape that is already there from the “H”). Make sure the middle of the Y is as close to the ETT as possible.



- The bottom strip of the “Y” is to be wrapped under and around the ETT in the same upward spiral as the “H” was. Do the same with the remaining “Y”, only start on the opposite cheek as the first “Y”.



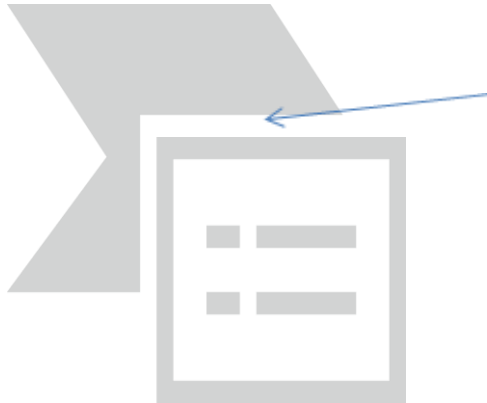
After the tube is taped in place, make sure the medical team orders a stat chest X-ray for your infant.

***Please refer to Safe Suction Cards for proper suctioning guidelines**

Safe Suction Cards

Work flow:

- RT will initially complete the card with ventilator set-up
- Cards will be housed in respiratory office
- Any updates to the card will be a joint effort with RT/RN
- When in use cards will be taped to the ventilator (refer to arrow)



ETT CARD:



AT THE FOREFRONT OF **KIDS** MEDICINE[®]
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For use with Kimvent Neonatal Y, size 6fr & 8fr

My name is: _____

Intubation date: _____

ETT Size: _____ Secured @ _____ cm at the: (circle one) Gums/Lip

Suction Cath Size: _____

To determine suction depth:

Look at number on ETT nearest ETT adaptor tip: _____ cm

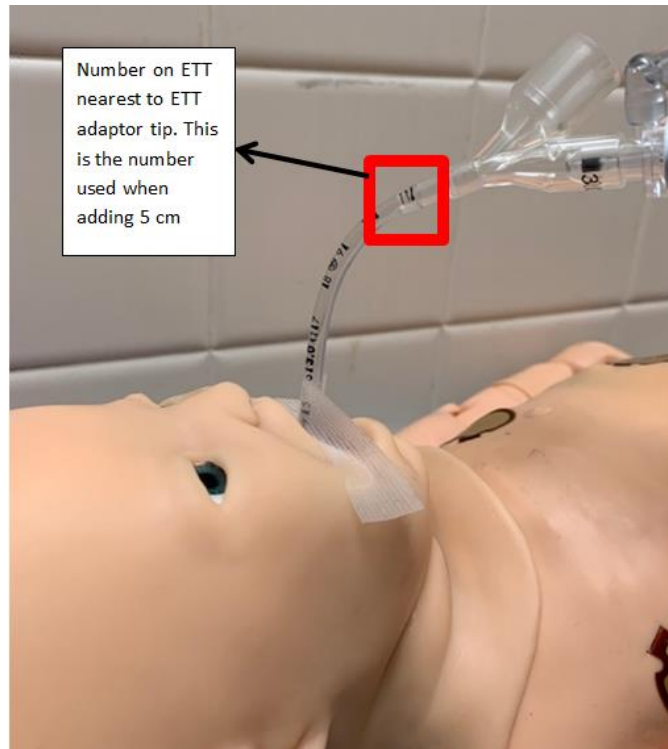
Add **5 cm** to suction at ETT tip **+5**

Equals suction depth total: _____ cm

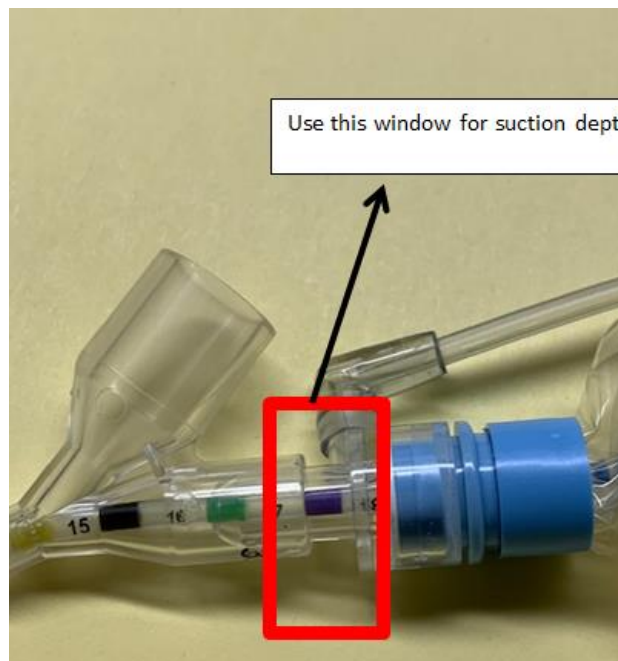
Please suction me to the _____ cm mark or Color _____

Assure that suction pressure is set at 80 to 100 mm Hg.


- ALL parts should be initially completed
- ETT nearest to adaptor tip is shown in the picture below



3. Add 5 cm to adaptor tip to get suction total depth
4. Complete cm mark with total suction depth and the color it is associated with
5. Suction to the proper window depth with associated color



TRACH CARD



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My Name Is: _____

Trach Brand: Shiley/ Bivona/ Custom/ Flextend MRI OK?: Y or N

Trach Size: _____ Neo/ Ped Custom Trach Length: _____ mm

Cuffed or Cuffless (circle one) Air or Sterile Water (circle one): _____ mL

Flextend: Y or N (if yes + 2cm for all suctioning)

Sterile Suction Catheter Size: _____ fr Suction Depth: _____ cm (+2 cm if Flextend)

Closed Suction Catheter Size: _____ fr Closed Suction Depth (+4 cm to total suction depth): _____ cm

Change My Trach On: _____

One Size Smaller Trach Brand and Size: _____

Notes: _____

Shiley	ID/OD/Length (mm)	Open Suction	Catheter size
Neo 3.0 \triangle	3.0/4.5/30	5 cm	6 Fr
Neo 3.5 \triangle	3.5/5.2/32	5 cm	6 or 8 Fr
Neo 4.0 \triangle	4.0/5.9/34	5.5 cm	8 Fr
Neo 4.5 \triangle	4.5/6.5/36	6cm	8 Fr
Peds 3.0 \triangle	3.0/4.5/39	6 cm	6 Fr
Peds 3.5 \triangle	3.5/5.2/40	6 cm	6 or 8 Fr
Peds 4.0 \triangle	4.0/5.9/41	6 cm	8 Fr
Peds 4.5 \triangle	4.5/6.5/42	6 cm	8 Fr
Peds 5.0 \triangle	5.0/7.1/44	6.5 cm	10 Fr
Peds 5.5 \triangle	5.5/7.7/46	6.5 cm	10 or 12 Fr
Adult 4.0 DCT \triangle	5.0/9.4/65	8.5 cm	10 or 12 Fr
Adult 6.0 DCT \triangle	6.4/10.8/76	10 cm	14 or 16 Fr
Adult 8.0 DCT \triangle	7.6/12.2/79	11.5 cm	16 Fr

Bivona	ID/OD/Length (mm)	Open Suction	Catheter size (Fr)
Neo 2.5 \star	2.5/4.0/30	5.5 cm	6 Fr
Neo 3.0 \star	3.0/4.7/32	5.5 cm	6 or 8 Fr
Neo 3.5 \star	3.5/5.3/34	6 cm	8 Fr
Neo 4.0 \star	4.0/6.0/36	6cm	8Fr
Peds 2.5 \star	2.5/4.0/38	6.5 cm	6 Fr
Peds 3.0 \star	3.0/4.7/39	6.5 cm	6 Fr
Peds 3.5 \star	3.5/5.3/40	6.5 cm	6 or 8 Fr
Peds 4.0 \star	4.0/6.0/41	6.5 cm	8 Fr
Peds 4.5 \star	4.5/6.7/42	6.5 cm	8 Fr
Peds 5.0 \star	5.0/7.3/44	7 cm	10 Fr
Peds 5.5 \star	5.5/8.0/46	7 cm	10 or 12 Fr
Adult 5.0 \star	5.0/7.3/60	8.5 cm	10 or 12 Fr
Adult 6.0 \star	6.0/8.7/70	10 cm	12 or 14 Fr
Adult 7.0 \star	7.0/10/80	11 cm	14 or 16 Fr

Add 4cm if utilizing closed (inline) suction to account for dead space

\triangle : MRI Conditional: Pilot line and balloon must be securely taped down at least 3cm away from area to be scanned

\star : MRI Conditional: Safe in magnetic fields \leq 3 Tesla for \leq 15minutes

1. Fill out card identifying the brand/cuff/flex extend etc.
2. The OPEN SUCTION on the back of the card will coordinate to the suction depth
3. The open suction is the length of the trach or obturator
4. 2 cm is added to the total if the trach is a **flex extend**
5. ADD 4 cm to the suction depth for closed line system

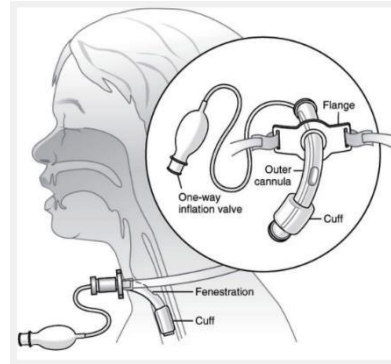
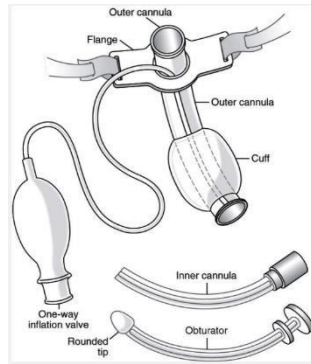


AT THE FOREFRONT OF **KIDS** MEDICINE®

UChicago Medicine

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Tracheostomy Care



Emergency Equipment at the bedside at all times (Documented at each shift their presence)

- AMBU bag and mask
- Nipple adapter (green Christmas tree)
- Suction Catheters
- Two extra tracheostomy tubes with obturators:
 - **one same size and brand**
 - **one step down size of the same brand**
- Obturator for current tracheostomy tube
- Water based lubricant
- Scissors
- Tracheostomy ties

**Tracheostomy care and tie change are performed to preserve skin integrity, decrease the risk of infection, and maintain airway security. **

Trach Skin Care (q shift & prn)

- Checks medical order form for any special instructions regarding tracheostomy site care
- Obtains help from another nurse or caregiver as needed and use standard precautions
- Cleanse skin with soap and water if established/healed (Sterile water ONLY if stoma not fully healed)
- Rinse with clean water and ensure skin dries
- Assess for breakdown/ document skin integrity

Trach Tie Change (q 24 hours & prn)

- Cut appropriate size trach ties or prepare Velcro ties.
- Identifies 2nd person to assist with the procedure
- Have the second person hold the trach tube in place while removing the old ties on the side opposite of the new ties.
- Assess skin for breakdown
- **If doing skin care and tie change**: Cleanse the back and the sides of child's neck with warm, soapy water, then dry thoroughly. **NEVER LET GO OF THE TRACH TUBE**
- Thread the new ties through the neck plate or tracheostomy tube flange. Bring the ties around the neck and thread the bottom tie through the opposite hole in the neck plate.
- Ensure that you are able to place **only one finger** between the ties and the child's neck. Tighten as needed.
- Monitor patient's respiratory and cardiopulmonary status and pulse oximetry for response to procedure
- Monitors patient's skin for irritation at pressure points of trach

Documentation

- Respiratory assessment Q3-4 unless ordered more frequently by Provider
- Documentation presence of emergency equipment at the beginning of each shift

Review Elsevier Skills

- Tracheostomy Tube: Change (Pediatrics)-CE
- Tracheostomy Tube: Stoma Care and Tie Change (Pediatrics)-CE

References:

Tracheostomy Tube: Stoma Care and Tie Change (Pediatric). (2020). In *Clinical Skills*. Retrieved from https://point-of-care.elsevierperformancemanager.com/skills/758/notes?skillId=CCP_010

VENTILATOR TERMS

CPAP (continuous positive airway pressure): Provides positive airway pressure that is sustained throughout the infant's spontaneous respiratory cycle. CPAP should stabilize alveoli while allowing the infant to breathe spontaneously

FiO₂ (fractional inspired oxygen): Percentage of oxygen delivered to the infant

I-time (inspiratory time): The amount of time needed to deliver one ventilator breath

I:E ratio (inspiratory/expiratory): The amount of time for inspiration vs exhalation

MAP (mean airway pressure): The average airway pressure measured at the proximal airway, starting from one inspiration to the beginning of the next

PEEP (positive end-expiratory pressure): the amount of pressure required to maintain open alveoli during expiration

PS (pressure support): A predetermined amount of pressure assistance provided with each spontaneous infant-initiated breath

SIMV/PC/PS (synchronized intermittent mandatory ventilation/pressure control/pressure support): The vent will deliver a full breath up to the preset inspiratory pressure at the specified rate. The vent coordinates the delivered breaths by sensing any spontaneous breaths by the infant. If no respiratory effort is sensed at the end of a specified time period, then a vent breath will be delivered. In addition, the vent will also SUPPORT any patient-initiated breaths, regardless how small, with a preset pressure (pressure support). Almost all of our infants will have PS ordered, because although they often will make an effort to initiate breaths, their poorly developed lungs and chest wall muscles do not always allow them to take **effective** breaths.

SIMV/VC/PS (synchronized intermittent mandatory ventilation/volume control/pressure support): The vent will deliver a full breath up to the preset tidal volume at the specified rate. Again, the vent coordinates the delivered breaths by sensing any spontaneous breaths by the infant. If no respiratory effort is sensed at the end of a specified time period, then a vent breath will be delivered. As in the above mode, the vent will SUPPORT any patient-triggered breaths with PS.

PRVC (pressure regulated volume control): A volume control mode that gives a preset tidal volume for each breath, however, the vent will only push the breath in up to a predetermined pressure. If the ordered TV cannot be given at or under this set

pressure, the vent will alarm to alert the health care team that the desired TV is not being delivered. This mode can also have PS added if desired.

HFOV (high frequency oscillatory ventilation): This ventilator uses a diaphragmatic piston unit causing vibration to actively move gas in and out of the lungs. It delivers very small tidal volumes at a rate at least 4 times that of normal respiration, to enhance O_2 delivery while providing adequate CO_2 removal. When an infant is placed on HFOV, it can take over 24 hours to reach optimal alveolar recruitment. Disconnecting from the circuit for even a few seconds will cause a massive loss of alveolar recruitment and can take 24-48 hours to re-recruit. Therefore, bagging is contraindicated except in emergencies. Infants on HFOV need Chest X-rays every day to check for optimal lung expansion (between 9th and 10th intercostal space)

Delta P (amplitude): measurement of the force of the piston oscillation back & forth; primary control of CO_2 removal ($\uparrow\Delta P = \downarrow PCO_2$ while $\downarrow\Delta P = \uparrow PCO_2$)

Hertz: essentially, the "rate", 1 Hz = 60 cycles, normally set at 9-15 Hz

I-Time: almost always set at 33%

MAP (mean airway pressure): main method of controlling oxygenation, primarily through lung expansion ($\uparrow MAP = \uparrow PO_2$). Improvement in oxygenation as evidenced by decreased F_iO_2 requirements may be an indication to wean the MAP. In addition, if the lungs are over expanded (past the 9th-10th intercostal space), the MAP will need to be weaned.

Vibration ("wiggle"): the movement caused by the oscillation, document where it starts and stops (i.e. from clavicle to umbilicus)

Intensity: how "loud" the lungs sound: low, moderate, high

Pitch: Similar to pitch or tone in music: low, moderate, high

**University of Chicago Medical Center
Neonatal Intensive & intermediate Care Units
Oxygen Delivery Methods & Ventilation Settings**

Ventilation Terms	Definition
Tidal Volume (TV)	Volume of air delivered in one mechanical breath
Mean Airway Pressure	The average airway pressure measured at the alveolar level, from one inspiration to the beginning of the next
Positive End-Expiratory Pressure (PEEP)	Responsible for maintaining open alveoli during expiration
Peak Inspiratory Pressure (PIP)	The peak pressure used to see chest wall movement.
Inspiratory Time (IT)	The amount of time needed to deliver one mechanical breath
Fractional Inspired Oxygen (FIO ₂)	The percent of oxygen delivered to a patient

Common Modes of Ventilation	Definition
Intermittent Mandatory Ventilation (IMV)	A set rate at which the ventilator will deliver mechanical breaths, but patient can breathe spontaneously between the mandatory breaths
Synchronized Intermittent Mandatory Ventilation (SIMV)	Same as IMV but synchronizes mandatory breaths with patient's own breaths.
Pressure Support	Vent delivers a set amount of support for each patient-initiated breath (helps to strengthen respiratory muscles)
Assist /Control (AC)	Vent delivers a fully supported breath, whether time or patient triggered
Volume Control	This is AC with a set tidal volume
Pressure Control	This is an AC mode with set PIP/PEEP
Volume Guarantee	Delivers a pressure-limited breath at a fixed flow
Pressure regulated volume control (PRVC)	An assist control mode that adjusts flow rate to deliver a preset tidal volume at or below a set maximum pressure.

ABG TABLE

	pH	pCO ₂	PO ₂	HCO ₃	Base Deficit
Normal ABG Ranges	7.30-7.40 <i>(premature)</i> 7.35-7.45 <i>(term)</i>	40-52 <i>(premature)</i> 35-45 <i>(term)</i>	60-80 <i>(premature)</i> 80-100 <i>(term)</i>	~20-28 <i>(all)</i>	Within + or - 2
Respiratory Acidosis	Decreased	Increased	Normal or Decreased	Normal or Increased	Normal
Metabolic Acidosis	Decreased	Normal or Decreased	Normal or Decreased	Decreased	< -2
Respiratory Alkalosis	Increased	Decreased	Normal or Decreased	Normal or Decreased	Normal
Metabolic Alkalosis	Increased	Normal or Increased	Normal or Decreased	Increased	> -2

Blood Gas Interpretation

Respiratory Acidosis: Acidosis resulting from pulmonary insufficiency, causing CO₂ retention; usually a consequence of an abrupt interference with alveolar gas exchange. A sudden change from normal blood gases to acidotic gases could signify a mechanical problem [secretions, ETT dislodged] or perhaps a pneumo or hemothorax.

Respiratory Alkalosis: Alkalosis resulting from hyperventilation, leading to a deficiency of carbonic acid (low CO₂ on the blood gas). The infant could be over-ventilated (vent settings) or could be tachypneic for various reasons such as pain/agitation/overheating.

Metabolic Acidosis: Acidosis resulting from any increase in acids (except carbonic). The infant may need a change in IVF to correct this; for example, removing sodium or potassium acetate from the HAL bag.

Metabolic Alkalosis: Alkalosis in which plasma HCO₃ is increased, with a proportionate rise in plasma CO₂. The infant may need some electrolyte supplementation to correct this (IV or oral).

BLOOD GAS MANAGEMENT CHEAT SHEET

PRESSURE VENTILATORS

IF:	THEN:
↓pH ↑pCO ₂ Normal pO ₂	↑rate, ↑PC/PS, or ↑TV (no increase in FiO ₂)
↓pH ↑pCO ₂ ↓pO ₂	↑rate, ↑PC/PS, or ↑TV (possibly increase FiO ₂ as well)
↑pH ↓pCO ₂ Normal pO ₂	↓rate, ↓PC/PS, or ↓TV (no increase in FiO ₂)
↑pH ↓pCO ₂ ↑pO ₂	↓rate, ↓PC/PS, or ↓TV (possibly wean FiO ₂ as well)

HIGH FREQUENCY OSCILLATORY VENTILATORS

IF:	THEN:
↓pH ↑pCO ₂ Normal pO ₂	↑ΔP
↓pH ↑pCO ₂ ↓pO ₂	↑ΔP & ↑MAP* or FiO ₂
Normal pH Normal pCO ₂ ↓pO ₂	↑MAP* or FiO ₂
↑pH ↓pCO ₂ Normal pO ₂	↓ΔP
↑pH ↓pCO ₂ ↑pO ₂	↓ΔP & ↓MAP* or FiO ₂
Normal pH Normal pCO ₂ ↑pO ₂	↓MAP* or ↓FiO ₂

MAP's are increased/decreased according to level of lung inflation; optimal inflation is between the 9th and 10th intercostal space

HELPFUL TIPS FOR VENTILATED PATIENTS

ATELECTASIS:

- Ensure correct ETT placement
- Position affected side UP
- May require increased vent settings
- Remembering to position baby facing AWAY from you $\frac{1}{2}$ the time, so they spend time lying on both sides, can help prevent atelectasis

PULMONARY HEMORRHAGE:

- \uparrow Peep
- Minimize suction if possible
- Acute bleeding may require some Epi down the ETT
- DO NOT remove the airway unless instructed to by an attending, fellow, or NNP who is standing at your bedside

PULMONARY EDEMA:

- May require a \downarrow in total fluids and/or diuretics
- May require \uparrow ventilator support, especially \uparrow peep


PULMONARY INTERSTITIAL EMPHYSEMA (PIE):

- Ensure correct ETT placement
- Position affected side DOWN
- Generally calls for \downarrow pressures, \uparrow rate, and \downarrow I time

INFANT'S WEIGHT	APPROXIMATE ETT SIZE
400-1000g	2.5
1000-2000g	3.0
2000-3000g	3.5
>3000g	4.0

A general rule of thumb is to tape the ETT at 6cm + the weight in kg, assuming the correct size ETT is used. Sometimes a smaller tube is used to prevent tracheomalacia; if that is the case then 6.5cm + the weight MAY need to be used instead. Placement should always be confirmed by X-ray

Oxygen Saturations in the NICU

- O² sats < 90% (exceptions-Congenital Cyanotic  Lesions)
- Monitor saturations using **set upper/lower limits** according to NICU guidelines

EQUIPMENT

- Ambu Bags-FiO₂ set 10-15% above the required FiO₂
- Pressure manometers and peep valves **required** on all patient ambu bags

DESATURATIONS

- Toleration of mild desaturations permitted
- If needed, ↑O₂ in 2-4% increments
- O₂ breaths via ventilator **not** advised as 1st rescue measure
- If necessary-give start breaths at current FiO₂ and then ↑ by 10% if no response
- If using hand ventilation, be sure to bag with pressures consistent with vent settings
- Suction support breaths should **not** exceed 10-15% of baseline FiO₂ (some vents are set at 100%, so make sure you dial the FiO₂ down on those vents. Some are set at 30%.)
- Attempt to wean back to baseline prior to leaving bedside

TITRATION/WEANING

- Wean O₂ for saturations above the upper limits (exceptions-infants going home on O₂)
- Titration of O₂ up/down rapidly **not** permitted as this can cause IVH; wean **slowly**
- Weaning FiO₂ not permitted on patients with PPHN without provider order

NURSING

- Patient assessment & documentation required with every permanent ↑ in FiO₂ (including increased requirements during feeds)
- Medical staff (MD, NNP) to be notified if sustained change in FiO₂ > 10%

REMINDERS

- SpO₂ lead position should be changed q6-8 hrs, or at least every other assessment

NOTES

- Apnea not treated with ↑ in O₂. Try stimulation, manual breaths from vent, or manual bag
- 1% decrease in FiO₂=10mmHg decrease in PaO₂
- Sudden ↑ or ↓ in O₂ concentration leads to sudden ↓ or ↓ in PaO₂ which can lead to pulmonary vasodilation/vasoconstriction

***Review newly approved O₂ saturation guidelines**

Chest Tubes 101

- Placed to drain either fluid or air from the pleural space
- Determine if it's a pneumothorax or pleural effusion by CXR or by transillumination (chest will be bright and will "light up" if pneumo present)
Position baby: ANTERIOR for pneumothorax (as air rises)
POSTERIOR for pleural effusion (as fluid is dependent)
- Obtain Chest Tube box located on shelf above crash cart in large plastic tub
- Chest tube insertion is VERY painful; ALWAYS provide analgesia

PREPARATION

- WATER SUCTION: (most commonly used) PLEUR-EVAC uses a water seal to prevent air from returning into pleural cavity. Fill with sterile water based on MD order (usually 10-20cm). The weight of the water acts as suction, and should bubble gently when set up and connected to CT. Turning up wall suction does NOT increase negative pressure. The ONLY way to increase pressure is by adding water to chamber.
- WATER SEAL: PLEUR-EVAC doesn't need to be connected to wall suction. Fill with sterile water to 2cm water level line. Assess this chamber for bubbling and fluctuating, should correspond to infant respirations. **Continuous bubbling indicates an air leak**
- DRY SUCTION: Use DRY SUCTION PLEUR-EVAC to provide more consistent suction flow because regulator adjusts suction to infant's pleural space. Use dial to set suction (orange float appears in suction control indicator window to indicate suction is ON). NO WATER needed unless using air leak meter. Fill with sterile water to fill line. Observe bubbling in the columns. **The higher the numbered columns through which bubbling occurs, the greater the degree of air leak**
- Keep a NEEDLE ASPIRATION KIT at bedside of VLBW infants, infants on high vent settings, infants with chest tubes, & infants on HFOV with high ΔP .

18 or 16 gauge Angio	Stopcock	T-connector
20 or 30ml syringe	Betadine swabs	2x2 gauze pads
Sterile gloves	Tegaderm	Steri-strips (optional)



- Attach T connector to stopcock. Attach syringe to stopcock opposite T connector.
- After angio has been inserted attach to T connector. Open stopcock to infant and syringe. Aspirate air back in syringe. Turn stopcock off to infant.
- Evacuate air from syringe. Turn stopcock open to infant and repeat. Be sure to document VS, infant's tolerance of procedure, amount of air evacuated, and location of angio insertion (Right or Left, Upper or Lower chest).

SETTING UP PLEUR-EVAC

- Full suction setup
- Sterile water
- PLEUR-EVAC- from chest tube box



1. Using funnel from PLEUR-EVAC, fill chamber to desired amount of suction
2. Using funnel from PLEUR-EVAC, pour into water seal chamber to fill to 2cm water line. If too much water was added, can remove the excess by swabbing the rubber port with betadine, accessing it with a needle and withdrawing some of the excess water
3. Attach short tubing to suction set up, adjust wall suction regulator only enough to create gentle bubbling
4. Attach long tubing to Chest Tube using STERILE technique
5. NNP/MD will suture the CT in place and apply a tegaderm dressing. Might also use a steri strip to chevron it securely
6. Apply zip ties at all connections and secure tubing to bed
7. Tape funnel to the back of PLEUR-EVAC so it is available to add more water when needed due to evaporation

suction control
ordered
enough water
water line. If

SETTING UP DRY SUCTION PLEUR-EVAC

- Full suction setup
 - Dry Suction PLEUR-EVAC
 - Sterile water, if using air leak indicator diagnostics
1. Use wall suction set up
 2. Adjust dry suction control dial in upper left corner on PLEUR-EVAC to amount ordered
 3. Adjust suction from wall suction until orange float appears in suction control window next to dry suction control dial
 4. If air leak diagnostics desired, use funnel from PLEUR-EVAC and fill water in air leak meter to fill line.

5. Tape funnel to back of PLEUR-EVAC so it is available to add more water when needed due to evaporation

ASSESSMENT AND DOCUMENTATION

Assess and document on flowsheet hourly on:

- Type of chest tube
- Amount of suction to chest tube
- Bubbling: with a pneumo there will be intermittent bubbling. Continuous bubbling usually indicates a leak in the set up.

With a pleural effusion you should not see bubbling, only fluctuations with breaths. Remember, it should ONLY bubble IF suction is ordered. If using dry suction, you assess and document on the infant control chamber because it determines whether or not the chest tube is working.

- Drainage should be noted on flowsheet hourly. Drainage should be marked on Chest tube PLEUR-EVAC with date and time at beginning and end of shift. **For pleural effusions: if chest tube is not draining it may be dislodged, occluded, or resolved**

DISCONTINUING CHEST TUBES

- Chest tube removal is VERY painful; ALWAYS provide analgesia
- Have emergency equipment readily available
- Chest tubes should be removed at the end of inspiration or during exhalation to prevent sucking air back into pleural space (done by MD/NNP only)
- Have chest dressing ready- xeroform gauze with 2X2 and tegaderm to apply immediately
- Monitor chest tube site (until healed) with each hands-on assessment
- Document VS, tolerance to procedure, and assessment of site

EXTRA TIPS

- Can Y together suction for multiple PLEUR-EVACs
- PLEUR-EVAC may be discontinued to transport an infant- use a Heimlich valve
- Must use cable ties at EACH connection
- Must keep PLEUR-EVAC BELOW the infant's chest level to ensure drainage
- If collection chamber is full, change the PLEUR-EVAC
- Maintain sterility of PLEUR-EVAC tubing end prior to connecting to chest tube
- If infant is on high PC vent settings, HFOV, or at risk for a pneumo, have needle aspiration set up available at bedside
- For pleural effusions, if a chest tube is NOT draining any fluid it may be dislodged, occluded, or effusion has resolved
- Remember to always get a CXR to check placement after chest tube insertion
- Positioning infant for pneumo: affected side UP as air rises
- Positioning infant for pleural effusion: affected side DOWN as fluid is dependent

PHARMACY & LABS



GUIDELINE NAME: Medication Dosing Sheet for the Neonatal Intensive Care Unit (NICU)

GUIDELINE NUMBER: PGP-33

ISSUE DATE: 01/2017

REVISED DATE: 6/2021

Analgesic Medications

Acetaminophen (PO): 10-15 mg/kg/dose
Acetaminophen (rectal): 15-20 mg/kg/dose
Fentanyl (IV): 0.5-2 mcg/kg/dose (slow IV push)
Morphine (PO/IV): 0.05-0.1 mg/kg/dose (PO:IV 2:1)

Sedation/Paralysis

Cisatracurium (IV): 0.1-0.2 mg/kg/dose
CloNIDine (PO)(withdrawal): 0.5-1 mcg/kg/dose Q6H
LORazepam (PO/IV): 0.05-0.1 mg/kg/dose (PO:IV 1:1)
Midazolam (IM/IV): 0.05-0.1 mg/kg/dose
Midazolam (Intranasal): 0.2 mg/kg (max: 0.5 mL/nosril)
Rocuronium (IV): 1 mg/kg/dose (range 0.6-1.2 mg/kg)

Antiepileptics

Fosphenytoin (IV)/Phenytoin (PO): Load: 15-20 mg/kg
- Maintenance: 2.5 mg/kg/dose Q12H
LevETIRacetam (PO/IV): Load (optional): 20-60 mg/kg
- Maintenance: 10-30 mg/kg/dose Q12H
LORazepam (IV): 0.1 mg/kg/dose
PHENobarbital (PO/IV): Load: 20 mg/kg
- Maintenance: 2.5 mg/kg/dose Q12H

Diuretics

AcetaZOLAMIDE (PO/IV): 5 mg/kg/dose Q6-12H
Chlorothiazide (PO): 10-20 mg/kg/dose Q12H
HydroCHLOROthiazide (PO): 1-2 mg/kg/dose Q12H
Furosemide (IV): 0.5-1 mg/kg/dose
Furosemide (PO): 1-2 mg/kg/dose

GI Medications

Erythromycin (PO/IV)(promotility): 2-5 mg/kg/dose Q6H
Famotidine (PO/IV): 0.5-1 mg/kg/dose
< 3 months: Q24H
> 3 months: Q12H
Lansoprazole (PO): 1-1.5 mg/kg/dose Q24H
(ENT = 3 mg/kg/dose Q24H)
Pantoprazole (IV): 0.6-1.2 mg/kg/dose Q24H
PHENobarbital (PO/IV)(cholestasis): 2.5 mg/kg/dose Q12H
Ursodiol (PO)(cholestasis): 10 mg/kg/dose Q8-12H

PDA Treatment

Acetaminophen (PO/IV): 15 mg/kg/dose Q6H x 3-7 days
Ibuprofen (PO):
Standard Dose: Initial 10 mg/kg x 1, then in 24 hours:
5 mg/kg/dose Q24H x 2 dose
High Dose: Initial 20 mg/kg x 1, then in 24 hours:
10 mg/kg/dose Q24H x 2 dose
Indomethacin (IV): 0.2 mg/kg/dose IV Q12H x 3 doses

Antimicrobial Prophylaxis

Amoxicillin (PO): 15 mg/kg/dose Q24H
Ampicillin (IV): 25 mg/kg/dose Q12-24H
Fluconazole (IV/PO): 6 mg/kg/dose
PMA < 30 weeks AND PNA ≤42 days: Q72H
PMA ≥ 30 weeks OR PNA > 42 days: Q48H
Sulfamethoxazole-trimethoprim (PO):
> 2 months: 2 mg trimethoprim/kg/dose Q24H

Apnea Prevention/Treatment

Caffeine (PO/IV):
- Loading dose: 20 mg/kg/dose
- Maintenance dose: 5-10 mg/kg/dose Q24H

Maternal Hepatitis B Unknown or Positive

Hepatitis B Vaccine (Recombivax HB): 0.5 mL IM x 1
Hepatitis B Immune Globulin: 0.5 mL IM x 1
HepB positive: give within 12 hours
HepB unknown, < 2 kg: give within 12 hours
HepB unknown, ≥ 2 kg: may wait 7 days for results

Pulmonary Hypertension

Bosentan (PO): 0.5-1 mg/kg/dose Q12H
Epoprostenol (Inhaled): 50 ng/kg/min (see hospital policy)
Milrinone (IV continuous): 0.25-1 mcg/kg/min
Sildenafil (PO): 0.25-2 mg/kg/dose Q6-8H
Sildenafil (IV): 0.125-1 mg/kg/dose Q6-8H

Emergency Medications

Adenosine (IV): 0.1 mg/kg/dose (max: 0.3 mg/kg/dose)
Atropine (IV): 0.02 mg/kg/dose
Calcium Gluconate (IV): 100 mg/kg/dose
Dextrose 10% (IV): 2 mL/kg/dose
Epinephrine (0.1 mg/mL) (IV): 0.1-0.3 mL/kg/dose
Epinephrine (0.1 mg/mL) (ET): PALS/NRP: 0.5-1 mL/kg/dose
Pulmonary hemorrhage: 0.1 mL/kg/dose
Hydrocortisone (Shock) (IV): 1 mg/kg/dose Q6-8H
Naloxone (IM/IV): 0.01 mg/kg/dose Q2min PRN
(up to max total of 0.1 mg/kg)
Poractant alfa (Curosurf): 2.5 mL/kg/dose by ET tube
May give repeat of 1.25 mL/kg Q12H x 2 more doses
Sodium Bicarbonate 4.2% (IV): 2-4 mL/kg/dose

CONTINUOUS INFUSIONS

Alprostadil (PGE₁): 0.01-0.1 mcg/kg/min
Insulin Regular (in D5W): 0.01 units/kg/hr (titrate by 0.01)

Sedation/Analgesia/Paralysis (starting dose)

Dexmedetomidine: 0.1-0.3 mcg/kg/hr (titrate up by 0.1-0.2)
FentaNYL: 0.5-1 mcg/kg/hr (titrate up by 0.5-1)
Morphine: 0.01-0.02 mg/kg/hr (titrate up by 0.01-0.02)
HYDROMorphone: 0.003-0.005 mg/kg/hr (titrate up by 0.005)
Midazolam: 0.03-0.05 mg/kg/hr (titrate up by 0.03-0.05)
Cisatracurium: 0.1 mg/kg/hr (titrate up by 0.1)

Vasopressors/Inotropes (usual range)

DOPamine: 2-20 mcg/kg/min (titrate by 1-2)
DOBUTamine: 2-20 mcg/kg/min (titrate by 1-2)
PINEPHrine: 0.01-0.5 mcg/kg/min (titrate by 0.01-0.05)
Milrinone: 0.25-1 mcg/kg/min (titrate by 0.1)
Vasopressin: 0.17-10 milliunits/kg/min (titrate by 0.1-0.5)

SUPPLEMENTATION

Type of Formula or Breastmilk	Weight	Multivitamin and Iron*
PREMATURE INFANT		
Breastmilk	< 2 kg	1 mL MV ³ and 4 mg/kg elemental Fe ¹
	≥ 2 kg	1 mL MV+Fe ²
Similac Special Care	< 2 kg	0.5 mL MV ³ and 4 mg/kg elemental Fe ¹
	≥ 2 kg	1 mL MV+Fe ²
Neosure	< 2 kg	0.5 mL MV+Fe ²
	≥ 2 kg	1 mL MV+Fe ²
TERM INFANT		
Breastmilk	ALL	1 mL MV ³
Term formula	< 2.5 kg	0.5 mL MV+Fe ²
	≥ 2.5 kg	None

¹ 1 mg elemental iron = 5 mg of ferrous sulfate

² MV+Fe = multivitamin with iron (1 mL = 10 mg elemental iron)

³ MV = multivitamin (1 mL contains 400 units of Vitamin D)

*For any patient with osteopenia or Alk Phos > 600 not already on 1 mL of MV, add either 1 mL MV or 400 units cholecalciferol

UNIVERSITY OF CHICAGO MEDICINE

NEONATAL ANTIMICROBIAL DOSING RECOMMENDATIONS

Antimicrobial	0 – 14 days	≥ 15	≤ 7 days		> 7 days		PMA > 44 weeks
	< 1 kg		1 – 2 kg	> 2 kg	1 - 2 kg	> 2 kg	
Acyclovir (IV)	20 mg/kg/dose q8h ¹						
Amphotericin B (conv) (IV)	1 mg/kg/dose q24h						
Amphotericin B (liposomal) (IV)	5 mg/kg/dose q24h						
Ampicillin (IV)	50 mg/kg/dose q12h	50 mg/kg/dose q8h	50 mg/kg/dose q12h	50 mg/kg/dose q8h	50 mg/kg/dose q6-8h ²	50 mg/kg/dose q6h	
Ampicillin (IV) (meningitis)	100 mg/kg/dose q8h	75 mg/kg/dose q6h	100 mg/kg/dose q8h		75 mg/kg/dose q6h	100 mg/kg/dose q6h	
Ampicillin/sulbactam (IV) ³	50 mg/kg/dose q12h	50 mg/kg/dose q8h	50 mg/kg/dose q12h	50 mg/kg/dose q8h	50 mg/kg/dose q6-8h ²	50 mg/kg/dose q6h	
Aztreonam (IV)	30 mg/kg/dose q12h	30 mg/kg/dose q8h	30 mg/kg/dose q12h	30 mg/kg/dose q8h	30 mg/kg/dose q6h		
Azithromycin (IV, PO)	20 mg/kg/dose q24h (for chlamydial infections); 10 mg/kg/dose q24h (for all other infections)						
CeFAZolin (IV)	25 mg/kg/dose q12h	25 mg/kg/dose q8h	25 mg/kg/dose q12h	50 mg/kg/dose q12h	25 mg/kg/dose q8h	50 mg/kg/dose q8h	30-50 mg/kg/dose q8h
Cefepime (IV)	30 mg/kg/dose q12h ⁴		30 mg/kg/dose q8h ⁴		30-50 mg/kg/dose q8-12h ^{4,5}	30-50 mg/kg/dose q8h ^{4,6}	50 mg/kg/dose q8-12h ⁷
CefoTAXime (IV)	50 mg/kg/dose q12h	50 mg/kg/dose q8h	50 mg/kg/dose q12h	50 mg/kg/dose q8-12h ⁷	50 mg/kg/dose q8h	50 mg/kg/dose q6h	
CeftAZidime (IV)	50 mg/kg/dose q12h	50 mg/kg/dose q8h	50 mg/kg/dose q8-12h ⁷			50 mg/kg/dose q8h	
Clindamycin (IV, PO)	5 mg/kg/dose q12h	5 mg/kg/dose q8h	5 mg/kg/dose q12h	5 mg/kg/dose q8h		5 mg/kg/dose q6h	13.5 mg/kg/dose q8h
Fluconazole (IV, PO)	25 mg/kg/dose x 1, then 12 mg/kg/dose q24h						
Ganciclovir (IV)	6 mg/kg/dose q12h						
Linezolid (IV, PO)	10 mg/kg/dose q12h	10 mg/kg/dose q8h	10 mg/kg/dose q12h	10 mg/kg/dose q8h			
Meropenem (IV)	20-40 mg/kg/dose q12h ⁷	20-40 mg/kg/dose q8h ⁷	20-40 mg/kg/dose q12h ⁷	20-40 mg/kg/dose q8h ⁷			
MetroNIDAZOLE (IV, PO)	15 mg/kg/dose x 1, then 7.5 mg/kg/dose q24h	15 mg/kg/dose x 1, then 7.5 mg/kg/dose q12h		15 mg/kg/dose x 1, then 7.5 mg/kg/dose q8h		15 mg/kg/dose x 1, then 10 mg/kg/dose q8h	10 mg/kg/dose q8h
Micalungin (IV)	10 mg/kg/dose q24h		7-10 mg/kg/dose q24h				2-4 mg/kg/dose q24h
Oxacillin (IV)	25-50 mg/kg/dose q12h ⁷	25-50 mg/kg/dose q8h ⁷	25-50 mg/kg/dose q12h ⁷	25-50 mg/kg/dose q8h ⁷		25-50 mg/kg/dose q6h ⁷	
Penicillin G (IV)(GBS meningitis)	125,000 units/kg/dose q8h ⁸	125,000 units/kg/dose q6h	125,000 units/kg/dose q8h		125,000 units/kg/dose q6h		
Penicillin G (IV) (cong syphilis)	50,000 units/kg/dose q12h ⁸	50,000 units/kg/dose q8h	50,000 units/kg/dose q12h		50,000 units/kg/dose q8h		50,000 units/kg/dose q6h
Piperacillin/tazobactam (IV) ¹⁰	100 mg/kg/dose q8h			80-100 mg/kg/dose q6h ¹¹			
ValGANCiclovir (PO)	16 mg/kg/dose q12h						

PNA = post-natal age; PMA = postmenstrual age; LD = loading dose

¹May consider reducing to acyclovir 20 mg/kg/dose q12h if < 1kg AND 0-14 days OR if 1-2 kg and < 8 days old

²Dose should be changed to ampicillin 50 mg/kg/dose q6h when PNA > 28 days

³Dose based on ampicillin component

⁴For patients with persistent infection, consider increasing the cefepime dose to 50 mg/kg/dose

⁵Dose should be cefepime 30 mg/kg/dose Q12H for PNA <=28 days and 50 mg/kg/dose Q8H for PNA >28 days

⁶Dose should be cefepime 30 mg/kg/dose for PNA <=28 days and 50 mg/kg/dose for PNA >28 days

⁷Use more frequent and/or higher dosing when concerned for meningitis

⁸Change dosing interval to penicillin G q6h when PNA > 7 days

⁹Change dosing interval to penicillin G q8h when PNA > 7 days

¹⁰Dose based on piperacillin component

¹¹Consider piperacillin 100 mg/kg/dose q8h if ≤ 30 weeks PMA and < 29 days

Table #1: Maternal Gentamicin Between 1h to 12h Prior to Delivery¹

STAT Gent Level	Birthweight < 2000 grams	Birthweight ≥ 2000 grams
≥ 6	36h post-level, start gent	24h post-level, start gent
4 to < 6	24h post-level, start gent	12h post-level, start gent
2 to < 4	12h post-level, start gent	6h post-level, start gent
< 2	NOW, start gent	NOW, start gent
Dosing	Gent 4 mg/kg IV q36h	Gent 4 mg/kg IV q24h

¹For maternal gentamicin < 1 hour or > 12 hours prior to delivery, no neonatal serum level is needed, and gentamicin should be started STAT

Table #2: Gentamicin Dosing

Weight (grams)	Age	Dose (mg/kg)	Interval (hours)
< 2000	PNA ≤ 7 days	4	36
≥ 2000		4	24
< 1000	PNA > 7 days	4	36
1000 - 3500		3.5	24
> 3500		2.5	12
All weights	PMA > 44 weeks	2.5	8

Table #3: Vancomycin Dosing

Weight (grams)	Age	Dose (mg/kg)	Interval (hours)
< 700	Any	20	18
700 - 1199	Any	15	12
1200-2000	PNA ≤ 7 days	17.5	12
	PNA > 7 days	15	8
> 2000	PNA < 30 days	15	8
	PNA ≥ 30 days	15	6
All weights	PMA > 44 weeks ¹	15	6

¹For PMA > 44 weeks, may start with a loading dose of 25 mg/kg

Last updated 6/2021 by Deborah Bondi, PharmD and Pooja Shah, PharmD

NICU Pharmacy Reference

Reviewed by: Deborah Bondi, PharmD; Pooja Shah, PharmD

Last Updated 5/17/19

CONTINUOUS FLUIDS AND MEDICATIONS EXPIRATION/BEYOND USE DATING

Plain D10W, D5W, 0.9% NaCl, and 0.45% NaCl are not mixed in pharmacy. These fluids are stocked by Central Supply. Therefore, these fluids bags must be changed every **96 hours** after being spiked.

IV bags of Dextrose, NaCl, or NaAcetate + heparin +/- electrolytes are prepared in pharmacy. The “expiration date” on these bags actually a **beyond use date (BUD)**. This means that the bag/syringe must be spiked/hung by the BUD, and then expires **24 hours after being hung**. RN’s should document on the label when they spike/hang an IV fluid so RN’s on future shifts know to replace this at 24 hours.

The BUD for ALL IV fluids prepared in bags or syringes from the pharmacy is **24 hours**.

Patient-specific continuous infusions of most medications (e.g. dopamine, cisatracurium, milrinone) are prepared in pharmacy. These medications receive a BUD of **24 hours**.

Common stock continuous infusions (e.g. fentanyl, midazolam) are labeled with a BUD (**generally ~24 hours** after making). Be careful to ensure the medication is not past its BUD when pulling from the Omnicell.

Parenteral nutrition and fat emulsion are dispensed by the pharmacy. These receive a BUD of **24 hours**.

Starter TPN are labeled with a BUD from the manufacturer (CAPS). This time can vary, however the Starter TPN still expires 24 hours after hanging. If a patient requires Starter TPN for > 24 hours, a new bag must be requested from the pharmacy.

Total Fluids and NPO rates

- ***Total Fluids (TF)** refers to the total amount of fluids a baby is to receive **PER KG** in a 24 hour time period (written as ml/kg/hr)*
- *The **NPO rate** is the total rate at which ALL the IV fluids run in the event the baby is currently or becomes NPO*
- *The **TRA rate** (to run at rate) is the rate at which the IV fluids are to be run if the baby is also receiving enteral feeds*
- *The **TRA rate plus the enteral feedings** the baby receives per hour should equal the NPO rate*

$$\text{NPO rate} = \frac{\text{TF} \times \text{Wt}}{24\text{hrs}}$$

This is the same equation as:

$$\text{NPO rate} = \frac{\text{ml}}{\text{kg/day}} \times \frac{\text{kg}}{1} \times \frac{1 \text{ day}}{24\text{hrs}}$$

$$\text{TRA rate} = \frac{\text{TF} \times \text{Wt} - 24 \text{ hrs of feeds}}{24 \text{ hrs}}$$

To double check the TRA rate:

$$\frac{(\text{ml/hr} \times 24 \text{ hrs}) + 24\text{hrs of feeds}}{\text{Wt (kg)}} = \text{TF (ml/kg/day)}$$

Ex) 1.3 kg, TF = 120ml/kg/day, D10 with lytes, NPO rate = 6.5ml/hr, SSC 24: 4ml NG q3hrs. What is the TRA rate for the IV fluids?

$$\text{TRA rate} = \frac{(120\text{ml} \times 1.3\text{kg}) - (32\text{ml of feeds})}{24\text{hrs}} = 5.2\text{ml/hr}$$

Let's double check the TRA rate:

$$\frac{(5.2\text{ml/hr} \times 24 \text{ hrs}) + 32\text{ml}}{1.3\text{kg}} = 120\text{ml/kg/day}$$

TIP: If the order says "TPN", the provider means the HAL rate **plus** the IL rate. When the order says "HAL", they mean **just** the HAL rate, this does not include the lipids.

Ex) Ordered **TPN** rate in your TF order is 10ml/hr, the ordered **IL** rate is 1.8ml/hr....so the **HAL** should run at 8.2ml/hr (10-1.8 = 8.2)

OH NO! THEY ORDERED a K+ RIDER!

(Don't panic, we can easily figure this out. Always have a second RN check the order with you)

EX) A 1.5 meq KCL rider is ordered for a 2.1 kg baby. Pharmacy sends you 1.5 meq in 3.75ml. The baby has maintenance fluids with 5 meq KCL in a 250ml bag, running at 12.5 ml/hr per UVC.

1. *Always remember, K+ can run no faster than 1 meq/kg/hr & must be diluted to 0.08meq/ml peripheral & 0.4meq/ml central, per UCH formulary*
2. *How fast should you run this K+ rider?*

First, figure out the rate at which the KCL from the maintenance IV bag is already running:

$$\frac{5\text{meq}}{250\text{ml}} \times \frac{1}{2.1\text{kg}} \times \frac{12.5\text{ml}}{1\text{hr}} = 0.12 \text{ meq/kg/hr}$$

Second, figure out the rate at which you can run the rider and still keep the grand total of KCL at **1 meq/kg/hr** by subtracting 0.12 from 1:

$$1 \text{ meq/kg/hr} - 0.12\text{meq/kg/hr} = 0.88 \text{ meq/kg/hr}$$

Therefore, you need to stretch out the 1.5 meq rider so that it runs in over a maximum of **0.88 meq/kg/hr**:

$$\frac{0.88 \text{ meq}}{\text{kg/hr}} \times \frac{2.1\text{kg}}{1} \times \frac{3.75\text{ml}}{1.5\text{meq}} = 4.6 \text{ ml/hr, or over } \sim 45 \text{ min}$$

time frame (approximately)

IV FLUIDS...WHAT CAN RUN WHERE?

	HAL/IL	<D12.5	>D12.5	Saline	Meds	Drips	Blood/ Albumin
UVC	Yes	Yes	Yes	Yes	Yes	Yes	Yes (BOTH ports)
UAC	HAL only (if no other access is available)	Yes	Yes	Yes	Yes* (only if no other access available) *(NEVER INOTROPES)	No	No
PICC	Yes	Yes	Yes* (if central)	Yes	Yes	Yes	No (unless >2.8Fr)
PIV	Yes (<D12.5)	Yes	No	Yes	Yes	Yes	Yes
C.L.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PAL	No	No	No	Yes	No	No	No
Tubing/Bag Change	HAL: q24° IL: q24°	Additives: Bag/ tubing q24° No additives: Bag q24°/Tubing q96°	q 24°	Bag q 24° Tubing q24° Transducer q 96°	q 24°	q 24°	q infusion

Carrier Fluids and Maintaining Line Patency

- Consider the following heparin-containing carrier fluids for arterial lines and extra lumens for central venous lines. These fluids will be dispensed in IV bags or IV syringes
 - Central Venous Access:
 - All weights/ages: Dextrose 5% in water (D5W) with heparin 1 units/mL
 - Central Arterial Access:
 - Weight ≤ 1500 grams and DOL < 14 days: Sodium acetate 0.45% with heparin 1 units/mL (usually dispensed in a 60 mL syringe)
 - Weight ≤ 1500 grams and DOL ≥ 14 days: Sodium chloride 0.45% with heparin 1 units/mL
 - Weight > 1500 grams: Sodium chloride 0.9% with heparin 1 units/mL
- The usual rate for carrier fluids is ≥ 0.5-1 mL/hr. See below table for minimum rates based on line type.

Line Type	Minimum KVO Rate	KVO Heparin Concentration	Primary Maintenance Fluid (primary TPN or D5/D10 + additives)
UAC/UVC	0.5 mL/hr	1 units/mL	0.5 units/mL
Single or Double Lumen PICC	<1500 grams: 0.5 mL/hr ≥1500 grams: 1mL/hr	1 units/mL	0.5 units/mL
Broviac/Cook Catheters	0.5 mL/hr	1 units/mL	0.5 units/mL

NICU/CTCU Laboratory Specimen Requirements

microtainers should be filled in between the lines unless otherwise specified

ACTH, Ammonia	1 Lavender Microtainer	Must be placed on ice
Basic Metabolic Panel (KPNL)	1 Green Microtainer	
KPNL, Ca, Mg, P, Bili	1 Green Microtainer	
KPNL & LPNL	1 *full* Green Microtainer	
CRP	1 Red Microtainer	
CBC/Diff or CBC/Diff/Platelets	1 Purple Microtainer or Vacutainer	If drawing from heelstick, first drop must be discarded
D-Dimer	1 Light Blue Vacutainer	Must fill with exactly 1.8ml
Genetics (Chromosomes)	1 Large Green Vacutainer	Minimum 1ml, optimum 3ml
G6PD	1 Purple Microtainer	
Hepatic Function (LPNL)	1 Green Microtainer	
Lactic Dehydrogenase	1 Green Microtainer	
Lactate	1 Gray Vacutainer	Must be placed on ice
Mini DIC Panel (PT, PTT, Fibrinogen, D-Dimer)	2 Light Blue Vacutainers	Each tube must be filled with exactly 1.8ml
Neonatal or Pediatric Bilirubin	1 Green Microtainer	0.5ml-0.8ml
Peaks & Troughs (drug levels)	1 Red Microtainer	
Pre-Albumin	1 Green Microtainer	
Pyruvate	2 Green Microtainers	Must be placed on ice
PT, PTT, & Fibrinogen	1 Light Blue Vacutainer	Must fill with 1.8ml
Selenium, Copper, Chromium, & Zinc	1 Navy Blue Vacutainer (found in secret drawer or ask PSC) (All 4 can be sent in same tube)	Selenium 1.0ml minimum Copper 0.4ml minimum; Chromium 0.8ml minimum; Zinc 0.4ml minimum Need all four? Send 2ml minimum
Thyroid levels	1 Red Microtainer	
Type & Screen	1 Purple Microtainer or Vacutainer	*Must have date, time, & initials of drawer on label*
Vitamin D, Alpha Hydroxy, Cortisol (in-house Vitamin D)	1 Red Microtainer	
1,25-Dihydroxyvitamin D (Vit D send out to Mayo)	3 Red Microtainers	Can also be sent in a red vacutainer, minimum amount 1.5ml

Always reference the Laboratory Handbook found on the Intranet

ss/lamb 10/17; updated 06/22 mrb

Drawing Blood Cultures (1ml min)



Drawing Blood Cultures Safe Practice Reminders:

- Perform hand hygiene and don appropriate PPE for the type of draw you are performing. A mask should be worn and sterile technique utilized anytime accessing a central line down to the hub (i.e. removal of the clave).
- Scrub the top of culture bottle with an **Alcohol swab** and allow to dry
- If drawing from a line, scrub the hub with CHG for 5 seconds and allow to dry before drawing sample
- Draw blood culture sample first before any other lab
- Discard is not needed when drawing blood culture sample from a central line
- When drawing venous or arterial samples, scrub skin with CHG only and allow to dry
- If needing to feel the pulse again, remember to scrub skin with a **new CHG swab** again and allow to dry
- A minimum of 0.5ml is needed for a blood culture sample
- Utilize a transfer device on blood culture bottle



Common contaminants for blood cultures include, but are not limited to:

- Corynebacterium species (not C. diphtheria though, that is a true pathogen)
- Bacillus species (not B. anthracis)
- Propionibacterium spp.
- Coagulase negative Staph species (like Staph epidermidis)
- Viridans group Strep (also known as "Alpha hemolytic strep")
- Micrococcus sp.

*Any of the above would be considered to be a "true pathogen" if there are more than 2 blood culture bottles (collected at separate times) by NHSN definitions.

Typical pathogens include but are not limited to:

- Any gram negative bacilli (like E. coli, Klebsiella, Enterobacter, Pseudomonas, Serratia, Stenotrophomonas, Acinetobacter, etc)
- Staph aureus
- Group B Strep
- Enterococcus sp.
- Group A Strep
- Yeast/mold
- H. influenzae
- Any of the common contaminants found in 2 bottles or more

UPDATE 2023: 1 full ml of blood is needed for blood cultures

Therapeutic

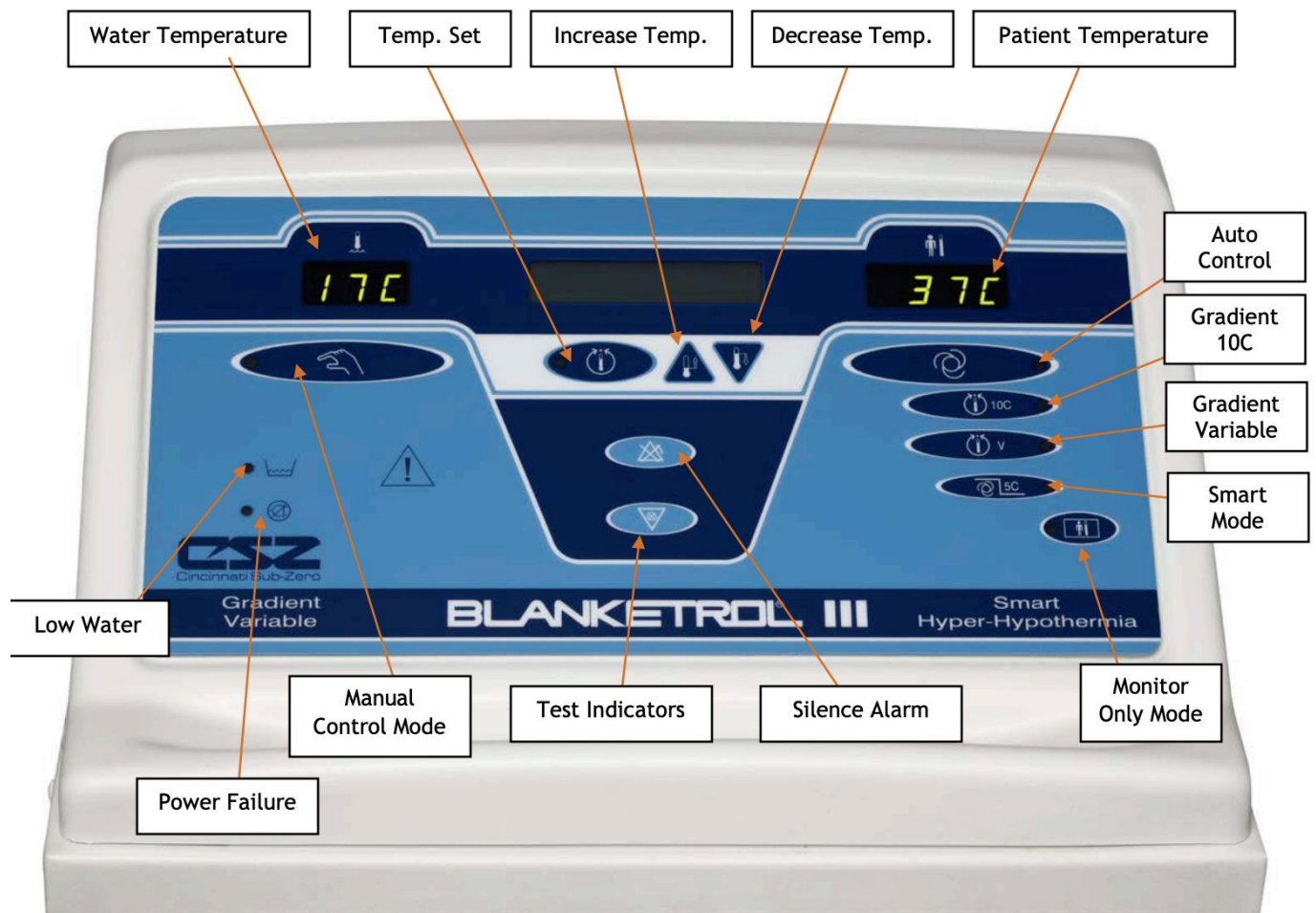


Hypothermia

Steps for using the Cincinnati Sub-Zero Blanketrol III Cooling Unit

EQUIPMENT NEEDED:

- Blanketrol III cooling unit
- Maxi-Therm Hyper/hypothermia blanket
- Connection hoses
- Esophageal probe and temperature adaptor
- 2.5 gallons of distilled water



Set up procedure for Cooling (preparing blanket and unit before infant is placed on it)

1. Connect black hoses into cooling unit and connect the other end to the blanket. You should hear a “click”



1 black and 1 white prong go into the blanket

2. Place blanket flat on radiant warmer. **Radiant warmer must be OFF.** Ensure no kinks in the hoses.
3. Ensure cooling unit is filled with approximately 2 gallons of distilled or sterile water prior to turning the machine on. Water should be visible, touching the strainer located on the back of the unit. Do not overfill.
 - a. Plug in cooling unit and turn on power switch (Rocker switch in front).
 - b. Insert temperature probe extension cord into probe jack on the top right side of the cooling unit.
 - c. If time allows pre-cool blanket:
 - i. Press **TEMP SET** button (this button stops water from entering blanket)
 - ii. Adjust **Set Point to 34°C** (ensures blanket is starting at or below room temperature)
 - iii. Press **MANUAL** button (this allows the water to cool down to pre-condition system for use) – While in manual mode, the objective is to control the water temperature and it is not adjusting to the patient temperature. **ENSURE WATER IS CIRCULATING INTO BLANKET**

Procedure for Cooling Phase (initiation of HIE therapy)

1. Place the infant supine and directly on the pre-cooled blanket
2. **Ensure the radiant warmer is OFF.**
3. Esophageal probe is to be placed by MD/NNP. Probe placement should be confirmed by X-ray and should lie at the T6-T9 level. *Patient/Auto Control will not work unless probe is in place*
4. Change the unit operation to **Patient Control** using the **AUTO CONTROL** button:
 - a. Press **TEMP SET** and adjust temperature per order (33-34) using the up and down arrows
 - b. Press the **GRADIENT VARIABLE BUTTON** and using the up and down arrows set the gradient variable off set to 20°C
 - c. Press the **GRADIENT VARIABLE BUTTON** again to start the flow of water.
 - i. The blanket may not feel cold but through conductive cooling the patient is getting cold

Procedure for Maintenance Phase

1. Once the infant core temperature is 34°C, press the **TEMP SET BUTTON**.
2. Press the **GRADIENT 10°C** button. In Gradient 10°C mode, the water will be a maximum of $\pm 10^\circ\text{C}$ different than the patient. This allows for tighter control and decreased risk of temperature “overshoot”
3. Press **SMART MODE** as a back-up mode. This will not kick in if NOT needed.

Procedure for Re-Warming Phase (termination of HIE therapy)

Begin rewarming infant as ordered after 72-hour cooling period.

GOAL: Increase the core (esophageal) temperature at a rate of 0.5°C per hour over a 6-hour period.

1. Increase the Blanketrol III **SET POINT** by 0.5°C each hour over the 6-hour period.
 - a. Press the **TEMP SET** button
 - b. Press the **UP** arrow to increase the **SET POINT** by 0.5°C
 - c. Press the **GRADIENT 10°C** button to start the water
 - d. If the infant is unable to maintain the set point temperature or not tolerating re-warming,

- i. Press the **GRADIENT VARIABLE BUTTON** and using the up and down arrows set the gradient variable off set to 20°C and then press the **GRADIENT VARIABLE BUTTON** again to start the flow of water.
 - ii. The purpose of this step is to allow more control with titrating between the patient temperature and the set parameters.
 - iii. Then press **SMART** button. This feature compares the patient's temperature to the target temperature every 30 minutes. If the blanket temperature and patient temperature are not the same, the cooling unit will adjust the water temperature by $\pm 5^{\circ}\text{C}$.
 - iv. Once the patient temperature and the **SET POINT** temperature are the same, the **SMART** mode will automatically shut off and the cooling unit will default to the original **10°C GRADIENT** mode.
2. At the end of the re-warming phase, put radiant warmer into servo-control with the skin temperature probe placed on the infant's abdomen.
 - a. At the end of the re-warming phase, the infant's core (esophageal) temperature should be 36.5°C.
 - b. Shutdown the cooling unit
 - i. Press the **TEMP SET** button to stop the flow of water
 - ii. Turn the cooling unit power switch to **OFF**
 - iii. Notify NNP/MD that re-warming is complete
 - iv. NNP/MD will remove the esophageal probe
 - v. Remove cooling blanket from under infant
 - c. Set the initial radiant warmer set point (skin control) temperature 0.5°C higher than the infant's current skin temperature
 - d. Do not allow infant to become hyper-thermic with a temperature 38°C for 48 hours after cooling.

FYI/ TROUBLESHOOTING OBJECTIVES

What are the water temperature ranges?

- Lowest water temperature is 4°C
- Highest water temperature is 42°C

What to do if machine shuts off due to safety feature?

- Turn machine on
- Press **MANUAL MODE** button and set the water temperature to $\geq 40.1^{\circ}\text{C}$.
 - **Remember:** While in manual mode, the objective is to control the water temperature and it is not adjusting to the patient temperature
- Once infant core temperature has reached 32°C, change the unit operation to **Patient Control** using the **AUTO CONTROL** button
 - **AUTO CONTROL** allows the machine to adjust temperature based on biofeedback from the patient
 - Press **TEMP SET** button
 - **Press the Up arrow to change to the SETPOINT to display cooling temperature indicated in orders.**
 - This will be the **SETPPOINT** for the following 72-hour period.
 - Press the **GRADIENT 10°C** button. In Gradient 10°C mode, the water will be a maximum of $\pm 10^{\circ}\text{C}$ different than the patient. This allows for tighter control and decreased risk of temperature "overshoot"
 - Press SMART MODE as a back-up mode. This will not kick in if NOT needed.

How hot is to hot?

- Exceeding 40°C for extended periods can cause tissue damage and burns.

What do I do if the water level is low?

- Press **TEMP SET** button (returns water to the unit)
- Add water to the unit. If water is low the unit will stop running water to the blanket and read "Low Water". When you see this more water should be added

How can I check the probe?

- Ensure the connection between the black cable and probe is tight, try unplugging and plugging back in)

- Confirm placement of probe (should be done with x-ray)
- If patient is over 30C or over 43.5C the machine will automatically shut off as a safety mechanism
- Press **TEMP SET** and place in **MANUAL MODE** if patient is >43.5 or <30

What if they do an x-ray?

- **The blankets are radiolucent, however, circulating water may create shadowing**
- Press **TEMP SET** to return water to machine and wait 30 seconds before taking the film. To resume press mode the blanket was originally in

What is there is low flow to the blanket?

- Check to ensure the hoses are not occluded
- Check for kinks

What do I do if there is a power surge or accidental unplug?

- Plug blanket back in
- The unit will default to 37C
- Return to original Set Point per physician order

What happens if my patient gets to cold?

- The infant's temperature may be below 30°C either during the cooling process or upon admission/arrival. If this occurs the cooling unit will automatically shut off as a safety feature

I pre-cooled the blanket. Why can I not continue to put the blanket in Patient Control Mode?

- During start up, when the operator attempts to begin one of the three Automatic Control modes with a Patient Set Point temperature selected outside the range of 30°C - 40°C (86°F - 104°F). The unit will not permit the operator to proceed to the Automatic Control modes until the Patient Set Point temperature setting is corrected:
- Proceed by pressing the **TEMP SET** button and change the **SET POINT** temperature to bring it within the allowable range.

Assessment and Monitoring Tip Sheet during Active Cooling

Initiation Phase

Assess and Document the following:

- Cooling Initiation Date and Time
- Axillary Temperature
- Esophageal Temperature
- Initial Vitals: Heart rate, respiratory rate, oxygen saturation, blood pressure
- Neurological Assessment

Cooling Phase

Assess and Document the following every **15 minutes for the first 4 hours** of therapy:

- Core (esophageal temperature)
- Blanket warmer temperature
- Set temperature on Cooling unit
- Vitals signs: Heart rate, respiratory rate, oxygen saturation, blood pressure
- Infant level of pain and sedation

Maintenance Phase – When all parameters of the cooling phase are stable for 1 hour

Assess and Document the following every 1 hour for the **first 12 hours of the maintenance phase**:

- Core (esophageal temperature)
- Blanket warmer temperature
- Set temperature on Cooling unit
- Vitals signs: Heart rate, respiratory rate, oxygen saturation, blood pressure
- Infant level of pain and sedation

Assess and Document the following every **3 hours** of therapy:

- Skin condition for breakdown
- Reposition infant
- Monitor and document urine output
- Neurological Assessment

Re-warming Phase – Begins at completion of the maintenance phase

Monitor and Document every **30 minutes and PRN** during re-warming phase:

- Core (esophageal temperature)
- Blanket warmer temperature
- Set temperature on Cooling unit
- Vitals signs: Heart rate, respiratory rate, oxygen saturation
- Infant level of pain and sedation

NICU Standard Documentation

Below are the basic expectations of documentation in the NICU/CTCU/MTCU. Any personnel working in (or floated to) the NICU are expected to follow these standards.

<u>Admission</u>	<u>Daily 1:1 and 2:1 Patients</u>	<u>Daily 3:1 and 4:1 Patients</u>	<u>Discharge</u>
Acknowledge all new orders	Acknowledge all new orders		Verify(Acknowledge) discharge order
Vital Signs (HR, RR, SpO2, BP, pain, and temp) Q15min x4 Q30min x2 Q1hr x4 Print Cart Sheet based on neonate weight	HR, RR, and SpO2 q1hr. BP and temp are per provider order (q2hr, q3hr, q4hr, or q6hr). Q15 min w/initiation of continuous opioid infusion (PC 117) Arterial line BP q1hr. Pain is documented with BP/temp and reassessed per PC 151, and with administration or initiation of continuous opioid infusions or bolus (PC117) Document Sedation scores on infants receiving benzodiazepine, phenobarbital, and opioids, Sedation (Guideline NPASS) FiO2 and O2 device settings q1hr and with changes. Apnea/bradycardia as applicable, do not chart "No" if none occurred.	HR, RR, SpO2, BP, and temp per provider order/with feedings. Pain is documented with vitals and reassessed per PC 151. If patient has oxygen support, then SpO2, FiO2, and O2 device settings are q1hr and with changes. Apnea and bradycardia as applicable.	HR, RR, SpO2, BP, pain, and temp
Head circumference, length, abdominal circumference	Weigh q24hrs on day shift(exceptions per specific protocols or provider order) Head circumference and length q7days (Sunday day shift)		Head circumference and length
NICU2 Assess Perform head-to-toe assessment Add appropriate cascades	NICU2 Assess First Assessment: Full head-to-toe assessment and document in all appropriate rows. Subsequent Assessments: Complete a thorough head-to-toe assessment, okay to document "WDL" or "NC" for system group if applicable. Neonatal Abstinence Syndrome (NAS) NAS scores should be recorded in the EMR every 3-4 hours while neonate is stable (i.e. AS scores <8). NAS scores should be recorded in the EMR every 2 hours while neonate is not well-controlled (i.e. FNASSS scores ≥ 8) (Guideline NAS Practice)		Head-to-toe assessment

<p>NICU Daily</p>	<p>Daily Care Identification must be charted with every assessment. Safety/Monitor Alarms with first assessment and with changes. Daily Care (if a positioner is removed, it should be charted why), Safe Sleep every assessment if CGA \geq34 weeks and clinically stable Safe Sleep provider Order Positioner should only be used by Order or OT note No medical equipment in bed ABC's of Safe Sleep Crib Card parental review Modifications (hat, extra blanket) must be ordered. Documentation completed at each assessment OR as the status of infant changes (PEDS NICU 10) Bathing Parent/Caregiver Educational Proficiencies, Parent/Caregiver Interaction, Speak Up Program, Row should be 'completed' once parent(s) informed) Vaccinations (Consented, VIS to parent/caregiver) Skin Assessment Newborn Circumcision Consent Epic Order – Epic green dot confirming should be done by 1030 Assess bleeding q15 x 1 hour then q30 min additional hour & with diapering Should not be discharged <2 hours post circumcision or bleeding (WCC-25) *Must void prior to discharge*</p> <p>Team Time Out Procedures performed outside of the operating rooms/procedural areas requiring the use of the Universal Protocol/Time Out documentation includes but is not limited to the following: (PC 38 Attachment A) Any procedure in which requires sedation or anesthesia Central Line/PCVC Insertion Intubation Chest Tube Insertion Upper/Lower GI Circumcision</p>	<p>Print immunization record Prints with the AVS</p>
<p>WALDO</p>	<p>WALDO with assessments and with changes. Wounds Airway Document endotracheal (ET) tube stability, <u>ETT mark in centimeters and ETT marking location</u> (differs from Elsevier skill doc) once per shift & as needed Inspect ventilator equipment and settings. (ES: Mechanical Ventilation(Neonatal)) Lines, PIVs q1 hour During the insertion of central vascular device an observer must be present who is NOT part of insertion team. Observer documents in the appropriate section of the Procedure Navigator. (PC 230) All devices inserted must be documented in the EMR. Documentation includes the following: 1. Type of Device 2. Location of the Tip 3. Length of the Line/Device 3. Date/Time of Insertion RN will document in WALDO their assessment and reassessment of the site, dressing change, and tubing and needleless connector (cap) change IV tubing should be labeled with the date of expiration, and the clinician's</p>	<p>Document on any WALDO being discharged with the patient. Remove any WALDO, document line assessment prior to removal, and complete the item if not being discharged with the patient.</p>

	<p>initials (PC 230)</p> <p>Assess and reassess IV insertion site for catheter placement, patency, and signs of infiltration or extravasation q hour and as needed.</p> <p>Document all rows 0700,1800,0600,1900 (ES: Central Venous Catheter: Site Care)</p> <p>Hemodynamic and Arterial Pressure Monitoring System is changed q24 hours from syringe to transducer, and change syringe, tubing, and transducer q96 hours (PC230)</p> <p>Drains</p> <p>Ostomy/Urostomy</p> <p>Document the appearance of the stoma and appliance as appropriate, (ES : Ostomy Care (Neonatal))</p>	
I&O Hourly	<p>I&O</p> <p>(Rate verify) IV Fluids q1hr and with changes</p> <p>All IV fluids labels must include the date/time when the fluids were spiked, and the RN or pharmacy staff initials (PC 230)</p> <p>Medications as given</p> <p>Output as measured</p> <p>CNG q1hr</p> <p>Timed feedings as given</p> <p>If no stool, do not document "0" or none, leave it blank</p> <p>If no emesis, do not document "0" or none, leave it blank</p>	
Needs Assess	Needs Assess as applicable	
NICU Discharge Checklist (discharge teaching begins at admission)	<p>NICU Discharge Checklist as applicable (discharge teaching begins at admission)</p> <p>Car Seat Challenge</p> <p>Complete Infant Car Seat Challenge for a minimum of 90 to 120 minutes or the duration of the car ride home if it is >120 minutes. On flowsheet indicate pass/fail.</p> <p>(ICSC)</p> <p>Record brand, model, and manufacture date of car seat, as well as type of seat Car bed ordered with 2nd failure (CSC Tip Sheet)</p> <p>Critical Congenital Heart Disease (CCHD)</p> <p>Exclusion Criteria: completed ECHO</p> <p>Observe the pulse oximeter reading for 60 seconds in the right hand and either foot</p>	Complete discharge checklist.
Release Lab Orders Collect and label specimen	Monitor labs	
Review allergies	Review allergies q24hr	Review allergies before discharge (AVS)
Scan pt & all admit medications	Scan patient and all due medications	
Education Teaching Topics ("Add Tile" and/or "Add Point")	<p>Education</p> <p>Update teaching as applicable, document under the Education activity tab. using the Resolve tab when goals are met and prior to discharge.</p> <p>Sign off GWN videos in EPIC after watched on iPad</p>	<p>Under Education tab resolve incomplete Assessments and Education points.</p> <p>Discharge RN will document in the infants EMR the provision and explanation SIDS and SUID educational materials (PC 160)</p>
Care Plan Individualized Plan of Care (POC) documented within 24 hours of admission.	<p>Care Plan</p> <p>RN document outcomes against patient goals EVERY SHIFT using maintaining, progressing, or not progressing</p>	Finalize Care Plans indicating: complete, or adequate for discharge

	(Pain-specific plan in Care Plan tab for continuous opioid infusions - PC 117-documentation)	(N1505)
Admission Note	Enter Progress Note into EMR with new patient condition, acute change, or significant event. (N1505)	RN prints AVS, Document RN Attestation Note to indicate med & instructions reviewed and AVS was given to guardian. (N1505) Write Discharge Note

References

N1505 Documentation of Patient Care inpatient Nursing
PC 230 Central Vascular Access Devices (2018)
PC 38 Universal Protocol/Time out (2018)
PC 160 Sudden Infant Death Syndrome (SIDS) and Sudden Unexpected Infant Death (SUID) Education (2019)
Elsevier Skill: Safe Sleep Practices (Pediatric)
PEDS NICU #10 NICU Safe Sleep Guideline (first page 'dates are missing; reviewed 2019 no revision date or approval)
Elsevier Skill: Central Venous Catheter: Insertion and Removal (2019)*
*Does not mention Observer role during insertion; does not specify that only practitioners may remove CVCs
Elsevier Skill: Ostomy Care (Neonatal) (2019)
Elsevier Skill: Admission Assessment (2020)
Elsevier Skill: Central Venous Catheter: Site Care (
Elsevier Skill: Mechanical Ventilation (Neonatal) (2019)
Guideline: Neonatal Abstinence Syndrome (NAS) Practice Guideline
Infant Car Seat Challenge (ICSC) (2020)
WCC-25 Neonatal Circumcision (2018)
Car Seat Challenge/Angle Tolerance Test TIP Sheet (2018 Krause no approval signatures)
PC 236 Pulse Oximetry Screening for Critical Congenital Heart Disease (2018)

Medication Monitoring Parameters

**For monitoring infants on the medications below, please defer to the referenced policies, orders written by providers, or by default the standard monitoring for the NICU*

- **Pain/Sedation/paralysis**
 - Medications
 - Dexmedetomidine (Precedex)
 - Fentanyl/IM

- Morphine
- Hydromorphone (Dilaudid)
- Midazolam (Versed)
- Lorazepam (Ativan)
- Methadone
- Cisatracurium
- Monitoring Parameters
 - NPASS Pain/Sedation Scores
 - RR, HR, BP, O2 saturation q1
 - Methadone-EKG for QT wave prolongation
 - NAS scores, if applicable
- ECMO-See Comer Guideline: ECMO Pain and Sedation Guideline

- **Vasopressors/Inotropes**

- Medication
 - Dopamine
 - Epinephrine
 - Vasopressin
 - Dobutamine
 - Milrinone
- Monitoring Parameters
 - MAP
 - BP
 - HR
 - Vasopressin-sodium, urine output
 - Dopamine-urine output (if added for low UOP)
 - Infusion site for extravasation (or not needed since this is a part of nursing care discussed above)
- Prostacyclin-Inhaled epoprostenol
 - See Policy & Procedures: PGP-89 and PGP-92

- **Diuretics**

- Medications
 - Furosemide

- Bumetanide
 - Chlorothiazide
- Monitoring Parameters
 - BMP
 - Blood Pressure
 - Heart Rate
 - Urine Output
- **Heparin Drips**
 - See Comer Guideline: ECMO Anticoagulation-NICU and PICU
- **IVIg**
 - Infusion Reaction (rare) but may include:
 - Hypersensitivity/anaphylactic reaction
 - Hypotension /shock
 - Fever
 - Chills
 - Nausea and vomiting
 - See NICU SharePoint Site: Pharmacy References for additional information
- **Caffeine**
 - HR
 - Apneic Episodes
- **Arginine Chloride/Potassium Chloride**
 - Electrolytes 1-2 times weekly, or as needed based on lab values

Neonatal References & Resources

1) Academy of Neonatal Nursing (ANN)

<http://www.academyonline.org/>

2) National Association of Neonatal Nurses (NANN)

<http://nann.org>

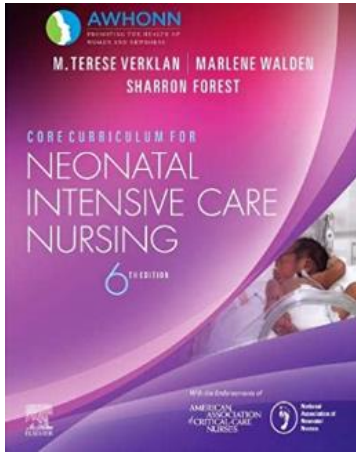
3) NICUniversity

<http://www.nicuniversity.org/>

4) National Certification Corporation (RNC_NICU)

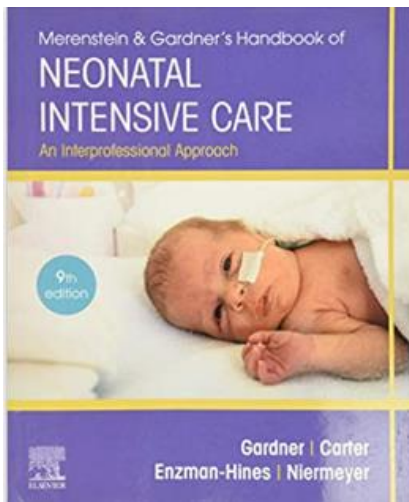
<http://www.nccwebsite.org/>

Neonatal Intensive Care Reference Books



Core Curriculum for Neonatal Intensive Care Nursing 6th Edition

by [AWHONN](#) (Author), [M. Terese Verklan PhD CCNS RNC FAAN](#) (Editor), [Marlene Walden PhD RN NNP-BC CCNS](#) (Editor), [Sharron Forest](#) (Editor)



Merenstein & Gardner's Handbook of Neonatal Intensive Care: An Interprofessional Approach 9th Edition

by [Sandra Lee Gardner RN MS CNS PNP](#) (Author), [Brian S. Carter MD FAAP](#) (Author), [Mary I Enzman-Hines APRN PhD CNS CPNP APHN-BC](#) (Author), [Susan Niermeyer MD MPH FAAP](#) (Author)

NOTES:



