



Neonatal Intensive Care Unit

APPE Student Rotation

*Developed by the Section of Inpatient Care Practitioners
Section Advisory Group on Pharmacy Practice Experiences (PPE)*

Rotation Description

The Neonatal Intensive Care Unit (ICU) rotation will help students become familiar with the key skills required as a clinical pharmacist in the Neonatal Intensive Care Unit (NICU). It will provide the student with the opportunity to be exposed and participate in the essential roles of the pharmacist in the NICU; including optimization of medication use through interaction with the Neonatal ICU Teams; order review; drug therapy monitoring; participation in high-risk procedures including resuscitation and other time dependent emergencies; monitoring use of high-risk medications; medication procurement and preparation; and provision of drug information. The goal of this rotation is to provide a clinical pharmacy practice environment for students to become familiar with the role of the pharmacist in the NICU, obtain experience in working with an interdisciplinary team and to work to optimize pharmacotherapeutic management and improve patient care and safety through helping to provide the services listed above. The student will participate in several activities to improve the student's working knowledge and experience with NICU patients – which include a wide scope of severity from step-down to the critically ill.

Goals and Objectives

The preceptor and student should agree on which goals and objectives are appropriate for the rotation based on rotation site, rotation objectives delineated by School/College of Pharmacy, rotation length, and student interests. The following are a list of potential goals and objectives:

1. Outline the workflow and pharmacy operations in the Neonatal Intensive Care Unit, as well as outline patient path from Labor and Delivery setting to hospital admission in Neonatal Intensive Care Unit. Identify opportunities for practice improvement.
2. Demonstrate ability to accurately and safely interpret medication orders, including identification and resolution of problems, compound and dispense medications.
3. Develop collaborative professional relationships and demonstrate good communication skills when providing verbal information, presentations and recommendations to the medical team.

4. Discuss pharmacotherapeutic topics and issues in neonatal ICU setting as detailed in the potential topics component.

Activities

During the course of the rotation, the student should participate in some of the following activities as assigned by the preceptor:

1. Attend and participate in all neonatal resuscitation emergencies under the supervision of the clinical pharmacist/preceptor.
2. Complete and discuss all assigned readings on time as assigned by preceptor. Prepare and lead at least one topic discussion to your peers on a relevant neonatal ICU topic.
3. Review medication profiles and pertinent laboratory data for assigned patients in the NICU setting for appropriateness of therapeutic regimens, drug interactions, and endpoint monitoring.
4. Monitor and evaluate drug therapy for all assigned NICU patients and make recommendations to optimize outcomes in the areas of drug selection, dose and indications for use. Be proactive in identifying, preventing and resolving drug –related problems.
5. Perform medication history and reconciliation on all patients who are readmitted to NICU.
6. Present and discuss assigned patients with preceptor.
7. Provide responses to questions regarding drug therapy, drug administration and other pharmacotherapeutic issues.
8. Answer drug information questions upon request in a timely manner, utilizing appropriate resources. Provide written, referenced responses to drug information questions as directed by preceptor.
9. Present a formal oral/written patient case presentation directed by preceptor.
10. Present a journal club article on a relevant clinical publication as directed by preceptor.
11. Participate in any neonatal ICU initiatives and assist in ensuring and monitoring compliance with guidelines.
12. Participate in all assigned pharmacy and interdisciplinary meetings relative to the care of neonatal ICU patients such as:
 - a. P&T Committee
 - b. NICU Safety Huddle
 - c. Department of pharmacy meetings that discuss the medication use system and patient safety (ex: Patient safety committee, Pharmacy medication management meeting)

- d. Neonatal Interdisciplinary Rounds
 - e. Neonatal Practice Committee Meeting
 - f. Pharmacy Department Student and Resident Conferences
 - g. Pharmacy Practice Meeting
 - h. Various other meetings as directed
13. Complete other activities as assigned by Preceptor

Topic Discussions

As time permits, preceptors should schedule time when they can discuss various topics with the student. Background readings should be provided when available. The student is expected to lead each topic discussion to the best of their ability and bring any additional questions/thoughts to their preceptor for further discussion.

Potential Topics

Please check **Appendix A** at the end of the rotation tool. It is an expanded list of suggested topics.

Projects

The student may be assigned at least one longitudinal neonatal ICU project. The preceptor and student should choose a project during the second week of rotation (see example projects listed below). Some projects listed may be more appropriate for students on extended length (several months in length) rotations, which should be considered when determining projects(s) to be completed. Student should present findings/deliverable to the appropriate audience during the rotation.

Example Projects

- High alert medication in the NICU
- CDC and Redbook guidelines for RSV; Current use in hospital setting
- DUE of medication shortages and impact on LOS in NICU patients and alternative treatments

Evaluation

- The preceptor will evaluate the student on achievement of the predefined goals and objectives for the rotation. Students will also be asked for any specific goals for the rotation.

- Students will also be evaluated on their interactions with pharmacists, pharmacy technicians, physicians, nurses and other staff within the organization, as well as daily discussions with the preceptor concerning patient care and discussion topics.
- The evaluation will include an oral mid-point evaluation to assess progress. The preceptor and student will complete a final written evaluation at the conclusion of the rotation according to school of pharmacy criteria.

Website Resources

Website	Resource
American Academy of Pediatrics	www.aap.org
March of Dimes: Premature Birth	http://www.marchofdimes.com
Shriners Hospital	http://www.shrinershospitalforchildren.org
Kids Health for Parents: A Primer on Premies	http://kidshealth.org/parent/growth/growing/preemies.html
<i>Preemie-L</i>	http://www.preemie-l.org/

Pediatric and Neonatal Dosage Handbook – A Comprehensive Resource for all Clinicians Treating Pediatric and Neonatal Patients, 19th Edition, by Carol K Taketomo, Pharm.D., et al., Lexicomp® 2012.

Koda-Kimble & Young’s Applied Therapeutics: The Clinical Use of Drugs, 10th Edition, by Brian K. Alldredge, et al., Wolters Kluwer 2012.

Neonatology, 7th Edition, by Tricia Lacy Gomella. McGraw Hill Lange.

Professional Neonatal ICU Organizations

Website	Resource
<i>Vermont Oxford Network</i>	

Educational Organization

Website	Resource
<i>NICUniversity</i>	
<i>Pediatric Pharmacy Advocacy Group</i>	
<i>Cochran Data Base</i>	

Neonatal ICU Journals

Journal	Resource
<i>Advances in Neonatal Care</i>	
<i>Archives of Disease in Childhood. Fetal and Neonatal Edition</i>	
<i>European Journal of Pediatrics</i>	
<i>Journal of Parenteral and Enteral Nutrition</i>	
<i>Journal of Pediatric Pharmacology and Therapeutics</i>	
<i>Journal of Perinatal Medicine</i>	
<i>Journal of Perinatology</i>	
<i>NeoReviews</i>	
<i>Neonatal Network</i>	
<i>Neonatology</i>	
<i>Newborn and Infant Nursing Reviews</i>	
<i>The Journal of Maternal-Fetal and Neonatal Medicine</i>	
<i>Pediatrics</i>	
<i>Pediatric Research</i>	
<i>Seminars in Fetal and Neonatal Medicine</i>	
<i>Seminars in Perinatology</i>	
<i>The New England Journal of Medicine. Articles in Pediatrics.</i>	

Other useful Websites

1. UpToDate
2. Clinical Pharmacology
3. Micromedex

4. PubMed
5. Ovid MEDLINE
6. MD Consult

Appendix A: Suggested Topics

1. General Care
 - a. Neonatal Pharmacokinetics (ADME)
 - b. Age and Weight specific dosing recommendations
 - c. Assessment of Therapy and Medication Therapy Management
 - d. Interpretation of Clinical Laboratory Tests
 - e. Acid-Base Disorders
 - f. Fluid and Electrolyte Disorders
 - g. Vaccinations
 - h. Infant transport
2. Nutrition Issues
 - a. Basics of Nutrition and Patient Assessment
 - b. Parenteral Nutrition
 - c. Enteral Nutrition
 - d. Lines, Access and Rates
 - e. Reflux disorders
 - f. Metabolic disorders (including glucose and calcium)
 - g. Osteopenia
3. Cardiac and Vascular Disorders
 - a. Patent Ductus Arteriosus (PDA)
 - b. Congenital Heart Disease in newborns
 - c. Refractory Hypotension
 - d. Hypertension
 - e. Extracorporeal Membrane Oxygenation (ECMO)
4. Respiratory
 - a. Respiratory Distress Syndrome (RDS)
 - b. Brochopulmonary Dysplasia (BPD)
 - c. Apnea of Prematurity
 - d. Persistent Pulmonary Hypertension of the Newborn (PPHN)
 - e. Meconium Aspiration
 - f. Neonatal Resuscitation, including physiology of transition and meconium aspiration

5. Neonatal Infection
 - a. Neonatal Sepsis (Bacterial and Viral)
 - b. Meningitis
 - c. Fungal Infections
 - d. Pneumonia
 - e. Cytomegalovirus
 - f. Respiratory Syncytial Virus (RSV)
 - g. Gonococcal Infections
 - h. Herpes Simplex
 - i. Chlamydia
 - j. Syphilis
6. Hematologic
 - a. Anemia of Prematurity
 - b. Thrombocytopenia
 - c. Hyperbilirubinemia
 - d. Cholestasis
7. Neurology/CNS
 - a. Neonatal Seizures
 - b. Hypoxic Ischemic Encephalopathy (HIE)
 - c. Sedation/Analgesia
 - d. Intraventricular Hemorrhage (IVH)
 - e. Neonatal Abstinence Syndrome (NAS)
 - f. Whole Body Cooling
8. Gastrointestinal
 - a. Gastric Aspirates (residuals)
 - b. Necrotizing Enterocolitis (NEC)
 - c. Spontaneous GI Perforation
9. Renal
 - a. Dehydration
 - b. Electrolyte balance
 - c. Urinary Tract Infections (UTI)
10. Miscellaneous
 - a. Congenital Adrenal Hyperplasia (CAH)
 - b. Congenital Diaphragmatic Hernia