The above chart shows the percentage distribution of questions on the Neonatal Intensive Care Nursing exam across the major content categories covered on the examination. The major focus of the examination is on General Assessment and Management and Assess & Manage Pathophysiologic States having the most emphasis. Lesser emphasis is on Psychosocial Behavioral States and Professional Issues having the least number of questions assigned to this content category.
## EXAMINATION CONTENT

### EXAM OUTLINE

This is an outline of topics and areas which may be included in the Neonatal Intensive Care Nursing examination

<table>
<thead>
<tr>
<th>Section</th>
<th>Topics</th>
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<tbody>
<tr>
<td>11.00</td>
<td>General Assessment and Management (48%)</td>
</tr>
<tr>
<td>11.01</td>
<td>Maternal History and Risk Factor</td>
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<tr>
<td>11.02</td>
<td>Gestational Age (At Birth)</td>
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<tr>
<td>11.03</td>
<td>Physical Assessment</td>
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<tr>
<td>11.04</td>
<td>Resuscitation and Stabilization</td>
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<tr>
<td>11.05</td>
<td>Fluids and Electrolytes</td>
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<td>11.06</td>
<td>Nutrition and Feeding</td>
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<tr>
<td>11.07</td>
<td>Oxygenation and Acid Base Homeostasis</td>
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<tr>
<td>11.08</td>
<td>Thermoregulation</td>
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<td>11.09</td>
<td>Pharmacology</td>
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<td>11.10</td>
<td>Developmental Care</td>
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<tr>
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<tbody>
<tr>
<td>12.00</td>
<td>Assess &amp; Manage Pathophysiologic States (44%)</td>
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<tr>
<td>12.01</td>
<td>Cardiac</td>
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<tr>
<td>12.02</td>
<td>Respiratory</td>
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<td>12.03</td>
<td>Gastrointestinal</td>
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<tr>
<td>12.04</td>
<td>Genitourinary</td>
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<td>12.05</td>
<td>Hematopoietic</td>
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<tr>
<td>12.06</td>
<td>Neurological/Neuromuscular</td>
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<td>12.07</td>
<td>Infectious Diseases</td>
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<td>12.08</td>
<td>Metabolic/Endocrine</td>
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<tr>
<td>12.09</td>
<td>Genetic Disorders</td>
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<td>12.10</td>
<td>Head, Eye, Ear, Nose Throat</td>
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<tr>
<td>13.00</td>
<td>Assess and Manage Psychosocial/Behavioral States (5%)</td>
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<tr>
<td>13.01</td>
<td>Discharge Planning and Follow up</td>
</tr>
<tr>
<td>13.02</td>
<td>Grieving Process</td>
</tr>
<tr>
<td>13.03</td>
<td>Family Integration</td>
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<tbody>
<tr>
<td>14.00</td>
<td>Professional Issues (3%)</td>
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</tbody>
</table>

*including: Evidence Based Practice, Legal/Ethical, Patient Safety*
ASSOCIATED COMPETENCIES

• Identify antepartal and intrapartal indicators of neonatal risk and their potential significance
• Systematically assess all body systems utilizing physical examination, gestational age assessment and neurobehavioral assessment
• Apply knowledge of anatomy and physiology (maternal, fetal, transitional, newborn), pathophysiology, pharmacology, nutrition, and behavioral psychology to assess the neonate and differentiate abnormal from normal
• Recognize normal values and deviations in clinical laboratory and diagnostic data and identify potential significance
• Utilize biophysical monitoring techniques to identify body system alterations
• Develop an individualized plan of care for the restoration, maintenance and promotion of health for the high risk neonate and family unit during hospitalization and following discharge
• Implement diagnostic, therapeutic and educational plans in collaboration with other health care providers to provide direct care for the high risk neonate and family
• Assess the neonate's family, community and environment to identify areas of risk
• Identify life-threatening states and initiate appropriate interventions
• Evaluate the plan of care in collaboration with other health care providers and the family and modify the plan of care as indicated
• Identify professional nursing issues which impact on the role of the neonatal nurse
I. Maternal History and Risk Factors
- Effects of maternal medical complications
  - hematologic (thrombocytopenia)
  - hypertension (chronic, gestational hypertension, HELLP Syndrome)
  - infections (CMV, Toxoplasmosis, syphilis, herpes, hepatitis, HIV, gonorrhea, chlamydia)
  - renal disease
- Problems associated with amniotic fluid and membranes:
  - amniotic bands
  - oligohydramnios
  - polyhydramnios
  - PROM and chorioamnionitis
- Significance of findings:
  - alpha-fetoprotein/triple quad/screen
  - biophysical profile
  - diagnostic ultrasound
- Recognize neonatal significance of fetal heart rate patterns
  - altered variability
  - decelerations (early, late, variable)
  - tachycardia, bradycardia
- Effects of maternal medications on the neonate
  - tocolytics
  - analgesia, anesthesia
- Problems in labor - impact on the neonate
  - breech and other malpresentation
  - maternal hemorrhage
  - meconium
- Obstetric emergencies (impact on the neonate)
  - abruptio placenta
  - cord prolapse
  - placenta previa
- Impact of methods of delivery on the neonate
  - (forceps, vacuum, cesarean)

II. Gestational Age (At Birth)
- Interpretation of growth curves
  - (weight, length and head circumference)
  - Physical and neuromuscular characteristics
  - preterm
  - term
  - post-term
  - AGA
  - SGA
  - LGA
- Associated risks with
  - preterm
  - post-term
  - SGA/IUGR
  - LGA

III. Physical Assessment
- Normal/abnormal findings regarding:
  - general appearance
  - head
  - eyes, ears, nose & throat
  - neck
  - chest
  - cardiovascular
  - respiratory
  - abdomen
  - genitalia
  - extremities
  - spine/back
  - skin
  - maintaining skin integrity
  - neuromuscular and reflexes

IV. Resuscitation and Stabilization
- Neonatal Cardiopulmonary Resuscitation
  (Per the American Heart Association & the American Academy of Pediatrics)
  - initial evaluation (ABC)
  - indications for ventilation
  - indications for intubation
  - indications for cardiac compressions
  - medications
- Use of drugs
  - epinephrine
  - volume expanders
• Resuscitation and stabilization of the neonate with
diaphragmatic hernia
hydrops fetalis
perinatal asphyxia
upper airway obstruction

V. Fluids and Electrolytes
• Normal fluid and electrolyte requirements
• Monitoring fluid and electrolyte status
electrolytes
urine output
• Effects of
humidity
maturity
temperature
• Specific problems
dehydration and overhydration
gastrointestinal abnormalities
insensible water loss
patent ductus arteriosus
post-asphyxia
third spacing
• Parenteral fluid therapy

VI. Nutrition and Feeding
• Nutritional requirements and effects of excess & deficiency
calories
carbohydrates
fat
minerals
protein
vitamins
• Enteral feeding
minimal enteral feedings (gut priming)
gavage feeding
bolus vs continuous feedings
feeding cues
feeding techniques
bottle feeding
formula composition
• Parenteral nutrition
indications
composition
complications
• Dietary supplements
breast milk fortifiers
glucose polymers
iron
MCT
Vitamins
probiotics
• Nutritional management for
bronchopulmonary dysplasia
prematurity
short gut syndrome

VII. Oxygenation/Ventilation and
Acid Base Homeostasis
• Oxygenation: interpretation and management
hypoxia/hypoxemia
oxygen saturation
principles re: increasing/ decreasing FiO\textsubscript{2} levels
pulse oximeter
• Methods of oxygenation/ ventilation
(indications, complications)
noninvasive ventilation
extracorporeal membrane oxygenation (ECMO)
high flow nasal cannula
• Mechanical ventilation
conventional
high frequency
other methods of oxygen delivery (hood, nasal cannula)
• Blood gases: interpretation and management
metabolic acidosis (compensated & uncompensated)
metabolic alkalosis (compensated & uncompensated)
respiratory acidosis (compensated & uncompensated)
respiratory alkalosis (compensated & uncompensated)
mixed
serum lactate
VIII. Thermoregulation
- Mechanisms of heat loss and production
  assessment of thermal state
  responses to hypothermia and cold stress
  responses to hyperthermia
- Maintaining a neutral thermal environment
- Management of thermoregulation problems
  evaporation
  conduction
  convection
  radiation
  hypothermia and cold stress
  hyperthermia
- Equipment
  Incubators and radiant warmers
  Heat mattresses and wraps

IX. Pharmacology
- Principles of neonatal pharmacology
  administration methods/issues
  absorption from GI tract, skin and muscle
  blood drug levels (toxic vs therapeutic)
  drug distribution in the body
  drug excretion
  drug incompatibilities
  drug withdrawal (therapeutic drugs)
  drug resistance
- Dosage calculations
- Common drugs
  anesthetics and analgesia (sedatives)
  antibiotics
  anticonvulsants
  antiviral drugs
  bronchodilators
  cardiovascular agents
  CNS stimulants (caffeine, etc)
  diuretics
  muscle relaxants
- Management of the drug exposed neonate
  Fetal alcohol syndrome
  Neonatal abstinence syndrome and scoring
  Substance use and abuse
- Laboratory drug testing

X. Developmental Care
- Neurobehavioral development
  habituation
  motor organization
  state organization
  sensory/interaction capabilities
- Self regulatory (stability) and stress responses
  autonomic
  motoric
  state/sleep cycles
  attentional
- Impact of the NICU environment
  physical
  light
  sound
  social
caregiver-infants interactions
patterns of caregiving
- Intervention strategies
  reducing noise levels
  reducing light levels/diurnal patterns
  altering care patterns
  handling/positioning
  kangaroo care/skin-to-skin
  nonnutritive sucking
  provision of sensory experiences
    auditory
    tactile
    visual
    vestibular and proprioceptive
- Pain
  assessment
  non-pharmacologic interventions
STUDY GUIDE

ASSESS AND MANAGE PATHOPHYSIOLOGIC STATES

I. Cardiac
• Transition to Extrauterine Life
• Cyanosis
  central vs peripheral
  cardiac vs pulmonary
• Specific Problems
  For all problems: presentation/assessment causes, management, complications, outcome
  arrhythmias
  cardiac tamponade
  congestive heart failure
  congenital heart defects
  AV canal
  coarctation of the aorta
  hypoplastic left heart
  pulmonary stenosis and atresia
  tetralogy of fallot
  transposition of the great vessels
  total anomalous pulmonary venous return
  ventricular septal defect
  cyanotic vs acyanotic disease
  hypertension
  patent ductus arteriosus
  shock
• Cardiovascular assessment
  blood pressure
  EKG
  cardiopulmonary monitoring
  indwelling lines

II. Respiratory
• Normal pulmonary function, surfactant
• Specific respiratory problems
  For all problems: presentation/assessment causes, management, complications, outcome
  apnea of prematurity
  bronchopulmonary dysplasia
  diaphragmatic hernia/paralysis
  hypoplastic lungs
  meconium aspiration
  persistent pulmonary hypertension
  pneumothorax/air leaks
  pulmonary hemorrhage
  respiratory distress syndrome
  transient tachypnea of the newborn
• Specific therapies
  For all problems: presentation/assessment causes, management, complications, outcome
  endotracheal intubation
  suctioning
  surfactant replacement therapy
  chest tubes and drainage systems

III. Gastrointestinal
• Normal gastrointestinal function
• Maturation of GI tract
• Specific GI problems
  For all problems: presentation/assessment causes, management, complications, outcome
  GE reflux
  GI bleeds perforation/peritonitis
  Hirschsprung’s disease
  intestinal obstructions (duodenal, jejunal, ileal, imperforate anus)
  meconium ileus/plug
  malrotation/volvulus
  necrotizing enterocolitis
  omphalocele/gastroschisis
  short gut syndrome
  ostomy care
  colitis
  bloody stools
  protein allergies
IV. Genitourinary
• Renal function/urinary output
• Specific genitourinary problems

For all problems: presentation/assessment, causes, management, complications, outcome

Genital
ambigious genitalia
inguinal hernia
testicular torsion

Urinary tract
asphyxial renal damage
renal abnormalities
renal failure
renal vein thrombosis

V. Hematopoietic
• Interpret laboratory values
CBC
hematocrit, hemoglobin
platelets
total and direct serum bilirubin
direct and indirect antibody test
Kleihauer Betke test

• Developmental differences
fetal vs adult hemoglobin
RBC differences

• Administration of blood and blood products
techniques
risks

• Hyperbilirubinemia
physiologic jaundice
causes of direct hyperbilirubinemia
causes of indirect hyperbilirubinemia
phototherapy

• Specific hematologic problems
anemia
coagulopathies/DIC
polycythemia and hyperviscosity
Rh and ABO incompatibility/hydrops fetalis
thrombocytopenia

VI. Neurological/ Neuromuscular
For all problems: presentation/assessment, causes, management, complications, outcome

• Birth injuries (neuromuscular)

• Hydrocephalus

• Hypoxic ischemic encephalopathy

• Neural tube defects

• Germinal matrix hemorrhage

• Intraventricular hemorrhage

• Periventricular leukomalacia

• Seizures

• Subdural hemorrhage

VII. Infectious Diseases
For all infections: presentation/assessment causes, management, complications, outcome

• Interpret laboratory values
WBC and differential cerebrospinal fluid

• Immature host defenses

• Neonatal sepsis/meningitis

• Viral and fungal infections
candidiasis
cytomegalovirus
hepatitis B
herpes
HIV/AIDS
toxoplasmosis
varicella

• Specific bacterial infections such as
E coli infection
Group B Streptococcal infection
Early/late onset staphylococcal infection
syphilis
enterovirus

• Infection control procedures
nosocomial infection
VIII. Metabolic/Endocrine
• Interpret laboratory values
calcium, phosphorus magnesium glucose
• Metabolic screening
PKU
Thyroid
CAH
Sickle cell
Galactosemia
• Glucose homeostasis
• Specific metabolic/endocrine problems
For all problems: presentation/ assessment, causes, management, complications, outcome
hypocalcemia and hypercalcemia
rickets
hypoglycemia and hyperglycemia
infant of diabetic mother
thyroid disorders
adrenal disorders

IX. Genetic Disorders
• Mendelian inheritance patterns
autosomal recessive
autosomal dominant
sex-linked
• Chromosomal anomalies and diseases
Trisomy 13
Trisomy 18
Trisomy 21
Multifactorial diseases
DiGeorge
Turners

X. Head, Eyes, Ears, Nose and Throat
• Eye prophylaxis
• Specific problems
For all problems: presentation/ assessment, causes, management, complications, outcome
cranial hematomas
choanal atresia
cleft palate/lip
retinopathy of prematurity
tracheal stenosis/atresia
tracheomalacia
tracheostomy
vocal cord paralysis
subgaleal
traceo-esophageal atresia (TEF)
esophageal atresia
micronathia
I. Discharge Planning and Follow-Up

- General discharge planning and parent teaching
  - car seats
  - CPR
  - CCHD screening
  - feeding
  - immunizations
  - SIDS/safe sleep/plageocephaly
  - Visitors
  - Shaken baby

- Discharge planning and parent teaching for infants with special needs
  - nutrition
  - medications
  - special equipment needs
  - special care needs
  - developmental follow up
  - visual screening
  - hearing screening
  - motor delay (including cerebral palsy)
  - cognitive/language delay

II. Grieving Process

- Anticipatory grief
- Stages of grieving and common behaviors and interventions
- Factors which impede/enhance grief process
- Pathologic responses
- Maternal/paternal differences (incongruent grieving)
- Specific circumstances
  - chronic sorrow
  - death of a twin (triplets, etc)
  - repeated obstetric loss (recurrent abortion, stillbirth, preterm delivery)
  - sibling responses
- Specific interventions with parents and extended family

- Counseling techniques
- Parent teaching
- Shared decision making
- Parent-staff disagreements regarding treatment

- Principles of culturally sensitive care
- Maternal psychiatric issues
  - Post traumatic stress disorder
  - Post-partum depression

III. Family Integration

- Parent-infant attachment behaviors
- Parental stress responses
  - high risk birth
  - changes in status
  - transfer
- Barriers to parent infant interaction
- Specific circumstances
  - adolescent parents
  - grandparents and other extended family
  - long distance nurturing of parent/infant attachment
- Sibling responses and interventions
- Specific interventions with parents and extended family
  - counseling techniques
  - parent teaching
- Shared decision making
  - parent-staff disagreements regarding treatment
- Principles of culturally sensitive care
- Maternal psychiatric issues
  - Post traumatic stress disorder
  - Post-partum depression
## Professional Practice Issues

### Ethical Principles
- Autonomy
- Beneficence
- Non-maleficence
- Justice

### Professional/Legal Issues
- Professional Regulation
- Practice
- Staffing issues
- Legal liability
- Consent
- Documentation/medical records
- Negligence/malpractice

### Evidence Based Practice
- Terminology
- Reliability
- Validity
- Significance
- Levels of Evidence
- Quality Improvement
- Research utilization

### Patient Safety
- Communication
- Interprofessional practice
STUDY RESOURCES

- Blackburn, Maternal, Fetal, & Neonatal Physiology, Elsevier, 2018
- Snell, et al., Care of the Well Newborn, Jones & Barlett, Burlington, 2017