

# Exam Blueprint and Specialty Competencies

## Introduction – Blueprint for the Critical Care Pediatrics Nursing Certification Exam

The primary function of the Blueprint for the CNA Critical Care Pediatrics Nursing Certification Exam is to describe how the exam is to be developed. Specifically, this blueprint provides explicit instructions and guidelines on how the competencies are to be expressed within the exam in order for accurate decisions to be made on the candidates' competence in critical care pediatrics nursing.

The blueprint has two major components: (1) the content area to be measured and (2) the explicit guidelines on how this content is to be measured. The content area consists of the list of competencies (i.e., the competencies expected of fully competent practising critical care pediatrics nurses with at least two years of experience), and the guidelines are expressed as structural and contextual variables. The blueprint also includes a summary chart that summarizes the exam guidelines.

### Description of Domain

The Critical Care Pediatrics Nursing Certification Exam is a criterion-referenced exam.<sup>1</sup> A fundamental component of a criterion-referenced approach to testing is the comprehensive description of the content area being measured. In the case of the Critical Care Pediatrics Nursing Certification Exam, the content consists of the competencies of a fully competent practising nurse with at least two years of experience.

This section describes the competencies, how they have been grouped and how they are to be sampled for creating an exam.

### Developing the List of Competencies

The critical care pediatrics nurses who participated in the development of the list of competencies were regionally representative of critical care pediatrics nurses in Canada. A working group developed a preliminary national list of competencies and the classification scheme to group these competencies. These competencies were reviewed by groups of critical care pediatrics nurses in Eastern, Western, and Central Canada. The final list of competencies was approved by the Critical Care Pediatrics Nursing Certification Exam Committee.

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1. Criterion-referenced exam: An exam that measures a candidate's command of a specified content or skills domain or list of instructional objectives. Scores are interpreted in comparison to a predetermined performance standard or as a mastery of defined domain (e.g., percentage correct and mastery scores), independently of the results obtained by other candidates (Brown, 1983).

## **ASSUMPTIONS**

In developing the list of competencies for pediatric critical care nursing, the following assumptions were made:

### **Health**

- Health is a state of complete physical, mental, social and spiritual well-being and not merely the absence of disease or infirmity.
- Health exists along a continuum influenced by many factors such as illness, disability, maturation, socio-economic status and the environment.
- Health is a resource by which an individual, group or community is able to realize aspirations and function in his/her environment.
- Health is a concept that is viewed within the context of the client's personal, family, cultural and ethnic value system.
- Health care may be directed toward promotion, prevention, maintenance, protection, rehabilitation/restoration or palliation.

### **The Client and Family**

- The critical care pediatrics client is one who is experiencing an actual or potential life-threatening health crisis.
- The client is viewed holistically within the context of a family.
- The family is defined by the client.
- The client's ability to communicate is influenced by the age, developmental level, health situation and/or intervention.
- Family-centred care is based on the understanding that the family is the client's primary source of strength and support and that the client's and family's perspectives and information are important in clinical decision-making.

### **The Environment**

- Critical care pediatrics nursing is practised in a highly technological environment within a health-care system (e.g., hospital, transport, unit).
- The physical environment is conducive to the 24-hour delivery of safe nursing care to critically ill clients and their families and includes appropriate resources (e.g., equipment, staff, support).

### **The Critical Care Pediatrics Nurse**

- The critical care pediatrics nurse is a highly knowledgeable and skilled health professional who works in a critical care setting in collaboration with other members of the interprofessional team, client and family.
- The critical care pediatrics nurse practises using a family-centred care philosophy.
- The critical care pediatrics nurse documents and communicates assessment data, the plan of care and client responses or outcomes to the client, family and health-care team within a time frame consistent with the client's condition.
- The critical care pediatrics nurse develops a therapeutic relationship with the client and family within a time frame appropriate to the situation using a family-centred care approach.
- The critical care pediatrics nurse supports, respects and addresses the client's and his/her family's needs for information, education and participation in the plan of care.
- The critical care pediatrics nurse uses teaching/learning strategies consistent with the time available, and the readiness and needs of the client and family.
- The critical care pediatrics nurse is constantly challenged to provide comfort and to maintain a client's privacy in a highly technological environment.
- The critical care pediatrics nurse considers the client's and family's ability to cope with stressors related to their health-care needs and the environment in developing the plan of care.
- The critical care pediatrics nurse strives to provide evidence-informed care within the specialty area.
- The critical care pediatrics nurse promotes research within the specialty area.
- The critical care pediatrics nurse uses knowledge of psychological, emotional and developmental aspects in caring for critically ill children.
- The critical care pediatrics nurse maintains professional competence through ongoing education, research and skill development.
- The critical care pediatrics nurse's practice is defined by the provincial/territorial scope of practice and institutional policies/protocols.
- The critical care pediatrics nurse identifies and addresses ethical, legal and professional issues.
- The critical care pediatrics nurse promotes a safe and healthy workplace in response to environmental, physical and psychosocial stress factors affecting interprofessional team members in the critical care pediatrics setting.
- The critical care pediatrics nurse identifies potential candidates for organ and tissue procurement and supports the process.

- The critical care pediatrics nurse works with the interprofessional team, client and family to provide timely care/treatment to ensure a smooth transition of clients and family within the health-care system and along the health continuum.
- The critical care pediatrics nurse works as a member of the interprofessional team to provide quality end-of-life care (e.g., palliative care, withdrawal of life support).
- The critical care pediatrics nurse recognizes the influence of culture on health and health-care and strives to provide culturally competent care.

### **The Critical Care Pediatrics Nursing Process**

- The critical care pediatrics nursing assessment is continuous, comprehensive and holistic using all available and appropriate resources.
- A holistic plan of care includes identified actual and potential problems/needs and prioritized interventions developed in collaboration with the client, family and interprofessional team.
- Outcomes of care are evaluated, and the plan of care is continuously revised in response to changes in the client's and family's status.

### **Competency Categories**

The competencies are classified under an eleven-category classification scheme. Some of the competencies lend themselves to one or more of the categories; therefore, these eleven categories should be viewed simply as an organizing framework. Also, it should be recognized that the competency statements vary in scope, with some representing global behaviours and others more discrete and specific nursing behaviours.

### **Percentage of Competencies in Each Group**

The following table presents the number and the percentage of competencies in each category.

**Table 1: Percentage of Competencies in Each Group**

<b>Category</b>	<b>Number of competencies</b>	<b>Percentage of the total number of competencies</b>
Professional Practice	6	3%
Psychosocial	20	12%
Pain and Anxiety	13	8%
Neurologic System	29	17%
Cardiovascular System	23	13%
Respiratory System	16	9%
Gastrointestinal System	16	9%
Renal System	12	7%
Endocrine and Metabolic Systems	12	7%
Immunology and Hematology Systems	13	8%
Musculoskeletal and Integumentary Systems	13	8%

### Competency Sampling

Using the grouping and guidelines, the Critical Care Pediatrics Nursing Certification Exam will consist of approximately 165 questions; the categories have been given the following weights in the total exam.

**Table 2: Competency Sampling**

<b>Categories</b>	<b>Approximate weights in the total examination</b>
Professional Practice	3-6%
Psychosocial	5-10%
Pain and Anxiety	5-10%
Neurologic System	12-18%
Cardiovascular System	20-25%
Respiratory System	20-25%
Gastrointestinal System	3-6%
Renal System	5-10%
Endocrine and Metabolic Systems	1-4%
Immunology and Hematology Systems	1-4%
Musculoskeletal and Integumentary Systems	1-4%

## Technical Specifications

In addition to the specifications related to the competencies, other variables are considered during the development of the Critical Care Pediatrics Nursing Certification Exam. This section presents the guidelines for two types of variables: structural and contextual.

**Structural variables:** Structural variables include those characteristics that determine the general appearance and design of the exam. They define the length of the exam, the format and presentation of the exam questions (e.g., multiple-choice) and any special functions of exam questions (e.g., independent questions).

**Contextual variables:** Contextual variables specify the nursing contexts in which the exam questions will be set (e.g., client culture, client health situation or health-care environment).

## Structural Variables

**Exam Length:** The exam consists of approximately 165 multiple-choice questions.

**Question Presentation:** The multiple-choice questions are presented in one of two formats: case-based or independent. Case-based questions are a set of approximately four questions associated with a brief health-care scenario (i.e., a description of the client's health-care situation). Independent questions stand alone. In the Critical Care Pediatrics Nursing Certification Exam, 60 to 70 per cent of the questions are presented as independent questions and 30 to 40 per cent are presented within cases.

**Taxonomy for Questions:** To ensure that competencies are measured at different levels of cognitive ability, each question on the Critical Care Pediatrics Nursing Certification Exam is aimed at one of three levels: knowledge/comprehension, application or critical thinking.<sup>2</sup>

### 1. Knowledge/Comprehension

This level combines the ability to recall previously learned material and to understand its meaning. It includes such mental abilities as knowing and understanding definitions, facts and principles, and interpreting data (e.g., knowing the effects of certain drugs or interpreting data appearing on a client's record).

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<sup>2</sup> These levels are adapted from the taxonomy of cognitive abilities developed in Bloom, 1956.

## 2. Application

This level refers to the ability to apply knowledge and learning to new or practical situation. It includes applying rules, methods, principles and theories while providing care to clients (e.g., applying nursing principles to the care of clients).

## 3. Critical Thinking

The third level of the taxonomy deals with higher-level thinking processes. It includes the abilities to judge the relevance of data, to deal with abstraction and to solve problems (e.g., identifying priorities of care or evaluating the effectiveness of interventions). The critical care pediatrics nurse with at least two years of experience should be able to identify cause-and-effect relationships, distinguish between relevant and irrelevant data, formulate valid conclusions and make judgments about the needs of clients.

The following table presents the distribution of questions for each level of cognitive ability.

**Table 3: Distribution of Questions for Each Level of Cognitive Ability**

Cognitive Ability level	Percentage of items on the Critical Care Pediatrics Nursing Certification Exam
Knowledge/Comprehension	20-30%
Application	30-40%
Critical Thinking	40-50%

## Contextual Variables

**Client Gender and Age:** Two of the contextual variables specified for the Critical care Pediatrics Nursing Certification Exam are the age and gender of the clients. Providing specifications for the use of these variables ensures that the clients described in the exam represent the demographic characteristics of the population encountered by the critical care pediatrics nurse.

**Client Culture:** Questions are included that measure awareness, sensitivity and respect for different cultural values, beliefs and practices, without introducing stereotypes.

**Client Health Situation:** In the development of the Critical Care Pediatrics Nursing Certification Exam, the client is viewed holistically. The client health situations presented also reflect a cross-section of health situations encountered by critical care pediatrics nurses.

**Health-Care Environment:** Pediatric critical care nursing is practiced primarily in the hospital setting. However, critical care pediatrics nursing can also be practiced in other settings. Therefore, for the purposes of the Critical Care Pediatrics Nursing Certification Exam, the health-care environment is only specified where it is required for clarity or in order to provide guidance to the examinee.

### **Conclusions**

The Blueprint for the Critical Care Pediatrics Nursing Certification Exam is the product of a collaborative effort between CNA, ASI, Canadian Association of Critical Care Nurses and a number of critical care pediatrics nurses across Canada. Their work has resulted in a compilation of the competencies required of practising critical care pediatrics nurses and has helped determine how those competencies will be measured on the Critical Care Pediatrics Nursing Certification Exam. A summary of these guidelines can be found in the summary chart: Critical Care Pediatrics Nursing Certification Exam Development Guidelines.

It is recognized that pediatric critical care nursing practice will continue to evolve. As this occurs, the blueprint may require revision so that it accurately reflects current practices. CNA will ensure that such revision takes place in a timely manner and will communicate any changes in updated editions of this document.

# Summary Chart

## Critical Care Pediatrics Nursing Certification Exam Development Guidelines

<b>Structural Variables</b>			
Exam Length and Format	Approximately 165 multiple-choice questions		
Question Presentation	60-70% independent questions 30-40% case-based questions		
Cognitive Ability Levels	Knowledge/Comprehension	20-30% of questions	
	Application	30-40% of questions	
	Critical Thinking	40-50% of questions	
Competency Categories	Professional Practice	3-6% of questions	
	Psychosocial	5-10% of questions	
	Pain and Anxiety	5-10% of questions	
	Neurologic System	12-18% of questions	
	Cardiovascular System	20-25% of questions	
	Respiratory System	20-25% of questions	
	Gastrointestinal System	3-6% of questions	
	Renal System	5-10% of questions	
	Endocrine and Metabolic Systems	1-4% of questions	
	Immunology and Hematology Systems	1-4% of questions	
	Musculoskeletal and Integumentary Systems	1-4% of questions	
<b>Contextual Variables</b>			
Client Age and Gender		<b>Male</b>	<b>Female</b>
	Birth – 12 months	15 - 25%	15 – 25%
	13 months – 5 years	10 – 20%	10 – 20%
	6 – 18 years	10 – 20%	10 – 20%
Client Culture	Questions are included that measure awareness, sensitivity, and respect for different cultural values, beliefs, and practices, without introducing stereotypes.		
Client Health Situation	In the development of the Critical Care Pediatrics Nursing Certification Exam, the client is viewed holistically. The client health situations presented also reflect a cross-section of health situations encountered by critical care pediatrics nurses.		
Health-Care Environment	It is recognized that critical care nursing is practiced primarily in the hospital setting. However, critical care nursing can also be practiced in other settings. Therefore, for the purposes of the Critical Care Pediatrics Nursing Certification Exam, the health-care environment is only specified where it is required for clarity or in order to provide guidance to the examinee.		

# ***The Critical Care Pediatrics Nursing Certification Exam List of Competencies***

## **1. Professional Practice**

The critical care pediatrics nurse:

recognizes actual and potential issues related to critical care pediatrics practice including:

legal and ethical (e.g., documentation, consent, confidentiality, end-of-life decision-making); 1.1a

healthy workplace (e.g., workload, moral distress); 1.1b

work-life balance (e.g., shift work, overtime); 1.1c

interprofessional collaboration; and 1.1d

safety (e.g., environmental, client). 1.1e

identifies and accesses available resources to address actual and potential issues related to critical care pediatrics practice (e.g., debriefing, client safety rounds, morbidity/mortality rounds, quality improvement initiatives). 1.2

## **2. Psychosocial**

### The Client

The critical care pediatrics nurse:

interprets data related to the client's psychosocial needs including:

client's health history (e.g., sensory function, developmental stage, previous hospitalizations and experiences, communication patterns, culture). 2.1a

recognizes the client's behavioural and emotional responses to his or her health crisis (e.g., verbal and non-verbal communication, withdrawal, regression, aggression, depression). 2.2

implements nursing interventions to address client's behavioural and emotional responses to illness including:

- acknowledging and validating client behavioural and emotional responses; 2.3a
- using distraction techniques (e.g., visual, auditory, tactile); 2.3b
- consulting and identifying resources and supports (e.g., family, child life therapy, psychology, pastoral care); 2.3c
- explaining diagnosis, procedures and environment; 2.3d
- providing for consistency and continuity of care; 2.3e
- providing opportunities for the client to make choices about care; and 2.3f
- personalizing client environment. 2.3g

implements nursing interventions to optimize communication including:

- establishing a therapeutic relationship (e.g., developmentally appropriate approach); and 2.4a
- using communication tools (e.g., communication boards, pictograms, translation). 2.4b

provides honest, factual and timely information regarding health-care crisis, care in hospital, transfer and/or discharge. 2.4c

### The Family

The critical care pediatrics nurse:

interprets data collected from family including:

- family health history (e.g., past experience within PICU and health-care system); and 2.5a
- family assessment (e.g., coping skills, family structure, relationships, roles, functions, behavioural/emotional responses, culture, communication patterns). 2.5b

recognizes actual or potential alterations in family functioning (e.g., withdrawal, emotional expressions, interpretation of information, ability to make decisions, risk for family violence). 2.6

implements nursing interventions to optimize family functioning during the health crisis including:

- practising client and family-centred care; 2.7a
- consulting with and identifying supports and resources for families (e.g., parent-to-parent support, pastoral care, social work); and 2.7b
- addressing stressors associated with current PICU admission. 2.7c

provides information to assist families in decision-making regarding organ and tissue donation, withdrawal of life-sustaining therapy and end-of-life care. 2.8

provides honest, factual and timely information regarding health-care crisis, care in hospital, transfer and/or discharge. 2.9

### 3. Pain and Anxiety

The critical care pediatrics nurse:

interprets data related to pain and anxiety including:

- client's health history (e.g., culture, previous experiences, communication patterns, coping strategies, mechanism of injury); 3.1a
- developmentally appropriate pain and sedation assessment tools; and 3.1b
- physical assessment (e.g., vital signs, location, intensity, quality and duration of pain). 3.1c

recognizes types of pain (e.g., acute, chronic, neuropathic) and the pain process (e.g., behavioural, cognitive and physiological responses). 3.2

recognizes the consequences of ineffective pain management (e.g., delayed recovery, sleep alterations, hyperesthesia, chronic pain syndromes). 3.3

recognizes signs and implications of withdrawal from pharmacological agents (e.g., benzodiazepines, narcotics, neonatal abstinence syndrome). 3.4

implements nursing interventions related to the prevention and alleviation of pain including:

- administering pharmacological agents (e.g., analgesics, adjunctive therapies); 3.5a
- using non-pharmacological strategies (e.g., therapeutic play, hot/cold compresses, distraction); and 3.5b
- managing medication delivery devices (e.g., patient-controlled analgesia [PCA] pumps, continuous infusions, epidurals). 3.5c

implements nursing interventions related to the prevention and alleviation of anxiety including:

administering pharmacological agents (e.g., sedatives, adjunctive therapies); and 3.6a

using non-pharmacological strategies (e.g., distraction, positioning, environmental management, relaxation techniques, family presence, non-nutritive sucking). 3.6b

participates in client procedures (e.g., complementary therapies, acupuncture). 3.7

implements nursing interventions to prevent or minimize withdrawal and agitation (e.g., promoting sleep and day/night cycle, weaning protocols for pharmacological agents). 3.8

#### 4. Neurologic System

The critical care pediatrics nurse:

interprets data related to the neurologic system including:

client's health history (e.g., sensory or motor function, developmental milestones, toxic ingestions); 4.1a

physical assessment (e.g., Glasgow Coma Scale [GCS], level of consciousness, protective reflexes, motor/sensory assessment, pupillary response, head shape and circumference, fontanel, newborn reflexes, respiratory patterns); 4.1b

information from monitoring devices: 4.1c  
 i) intracranial pressure (ICP)  
 ii) cerebral perfusion pressure (CPP);

laboratory reports (e.g., serum and urine glucose, electrolytes and osmolality, cerebral spinal fluid [CSF], blood gases, urine specific gravity, toxicology and drug levels, coagulation profile); and 4.1d

diagnostic reports (e.g., imaging, electroencephalogram [EEG], biopsies). 4.1e

recognizes actual or potential life-threatening alterations in neurologic function including:

- thermoregulation; 4.2a
- motor and sensory function (e.g., Guillain-Barré syndrome, spinal cord injury, muscular dystrophy, myelomeningocele, Arnold-Chiari deformity); 4.2b
- cerebral vascular integrity (e.g., stroke [brain attack], arteriovenous malformation [AVM]); 4.2c
- increased intracranial pressure (ICP) (e.g., hydrocephalus, cerebral edema, intracranial bleed); 4.2d
- traumatic brain injury (e.g., epidural hematoma); 4.2e
- anoxic brain injury (e.g., submersion injury); 4.2f
- herniation syndrome (e.g., Cushing’s triad); 4.2g
- seizures (e.g., status epilepticus); 4.2h
- infection (e.g., meningitis, encephalitis); 4.2i
- spinal cord crises (e.g., neurogenic shock, autonomic dysreflexia); 4.2j
- neurosurgical intervention (e.g., tumour resection); and 4.2k
- neurological determination of death (e.g., apnea testing, oculovestibular and oculocephalic reflexes). 4.2l

implements nursing interventions to optimize motor and/or sensory function including:

- preserving spinal cord integrity (e.g., C-spine precautions, pharmacological agents); and 4.3a
- preventing and managing spinal cord crises. 4.3b

implements nursing interventions to optimize cerebral perfusion and prevent secondary injury including:

- using techniques to promote cerebral venous and spinal fluid drainage (e.g., positioning, elevating head of bed, minimizing intrathoracic pressure); 4.4a
- managing PaCO<sub>2</sub> and PaO<sub>2</sub>; 4.4b
- administering pharmacological agents (e.g., anticonvulsants, diuretics, hyperosmolar therapy, barbiturates, analgesics, sedatives, neuromuscular blocking agents, steroids); 4.4c
- managing intracranial pressure monitoring and/or cerebral spinal fluid drainage devices (e.g., set-up, drainage, levelling of device, specimen collection); 4.4d
- minimizing noxious stimuli (e.g., environmental, nursing care considerations); 4.4e
- managing metabolic demands (e.g., thermoregulation, pharmacological agents); 4.4f
- managing endocrine alterations (e.g., hyperglycemia, syndrome of inappropriate antidiuretic hormone [SIADH], diabetes insipidus [DI], cerebral salt wasting [CSW]); 4.4g
- preventing and managing seizure activity; 4.4h
- managing mean arterial pressure (e.g., fluids, pharmacological agents); and 4.4i
- using techniques to promote client safety and support during procedures (e.g., insertion of intracranial pressure [ICP] probe, external ventricular drainage [EVD] catheter, lumbar drain/puncture). 4.4j

## 5. Cardiovascular System

The critical care pediatrics nurse:

interprets data related to the cardiovascular system including:

- client's health history (e.g., congenital heart defects, acquired cardiac disease, transplant, newborn transitional circulation); 5.1a

physical assessment (e.g., indicators of systemic perfusion, heart sounds, hepatosplenomegaly, four limb blood pressures, level of consciousness);	5.1b
information from monitoring devices:	5.1c
i) non-invasive (e.g., ECG for rhythm and rate, pulse oximetry, pre/post ductal saturations, non-invasive blood pressure [NIBP], temperature)	
ii) invasive (e.g., pressures and waveforms, venous, arterial and intracardiac [right atrial, left atrial, pulmonary artery pressure]);	
laboratory reports (e.g., CBC, arterial, venous, capillary and mixed venous blood gases, coagulation, electrolytes, lactate, drug levels); and	5.1d
diagnostic reports (e.g., imaging, ECG).	5.1e
recognizes actual or potential life-threatening alterations in cardiac output and perfusion including:	
cardiogenic shock (e.g., cardiomyopathy, congenital heart defects);	5.2a
hypovolemic shock (e.g. hemorrhagic and non-hemorrhagic);	5.2b
distributive shock (e.g., neurogenic, sepsis, anaphylaxis);	5.2c
obstructive shock (e.g., cardiac tamponade, tension pneumothorax);	5.2d
congenital heart defects (e.g., increased/decreased pulmonary blood flow and obstructive defects);	5.2e
congestive heart failure (e.g., increased pulmonary blood flow defects, myocarditis, cor pulmonale);	5.2f
systemic hypertension (e.g., coarctation of the aorta, obesity, renal dysfunction);	5.2g
pulmonary hypertension (e.g., persistent pulmonary hypertension of the newborn [PPHN]); and	5.2h
dysrhythmias (e.g., supraventricular tachycardia [SVT], bradycardia, heart blocks).	5.2i
recognizes indications for extracorporeal life support (ECLS) (e.g., severe hypothermia, emboli, myocardial dysfunction).	5.3
recognizes complications of extracorporeal life support (ECLS) (e.g., bleeding, neurological insult, infection).	5.4

implements nursing interventions to optimize perfusion and cardiac output including:

- administering oxygen (e.g., differentiating cardiac versus respiratory cyanosis, consequences of O<sub>2</sub> administration); 5.5a
  - supporting preload, contractility, afterload (e.g., pharmacological agents, fluid administration); 5.5b
  - supporting heart rate or rhythm (e.g., fluid administration, pharmacological agents, pacing, cardioversion, defibrillation); 5.5c
  - managing coagulation (e.g., thrombolytics, anticoagulants, blood products); 5.5d
  - participating in the management of cardiac emergencies; and 5.5e
  - using techniques to promote client safety and support during procedures (e.g., insertion of central venous line, pericardial drain). 5.5f
- manages hemodynamic monitoring devices (e.g., results, interpreting findings, set-up, levelling, patency). 5.6

## 6. Respiratory System

The critical care pediatrics nurse:

interprets data related to the respiratory system including:

- client's health history (e.g., prematurity, bronchopulmonary dysplasia, congenital defects); 6.1a
- physical assessment (e.g., airway, respiratory status, breath sounds, colour, level of consciousness, chest contour, cough, secretions); 6.1b
- information from monitoring devices (e.g., pulse oximetry, CO<sub>2</sub> monitoring, ventilation parameters); 6.1c
- laboratory reports (e.g., arterial, venous, capillary and mixed venous blood gases, cultures, carboxyhemoglobin, methemoglobin); and 6.1d
- diagnostic reports (e.g., imaging, pulmonary function tests). 6.1e

recognizes actual or potential life-threatening alterations in respiratory function including:

mechanisms of inadequate oxygenation and ventilation: 6.2a

- i) upper airway obstruction (e.g., foreign body, croup, post-extubation stridor, laryngospasm, inhalation injury, congenital anomalies)
- ii) lower airway obstruction (e.g., bronchiolitis, asthma)
- iii) parenchymal conditions (e.g., pneumonia, pulmonary edema, acute respiratory distress syndrome [ARDS])
- iv) disordered control of breathing (e.g., seizures, pharmacological agents, brain injury)
- v) neuromuscular/skeletal conditions (e.g., Duchenne’s muscular dystrophy, spinal muscular atrophy [SMA], scoliosis)
- vi) intrapleural conditions (e.g., chylothorax, pneumothorax); and

mchanisms of hypoxemia (e.g., low ambient PO<sub>2</sub>, alveolar hypoventilation, V-Q mismatch, cyanotic heart disease). 6.2b

implements nursing interventions to optimize respiratory function including:

managing airway: 6.3a

- i) positioning (e.g., jaw thrust/chin lift)
- ii) artificial airways (e.g., patency, size, position, securing)
- iii) secretions (e.g., mobilization, suctioning);

managing invasive and non-invasive mechanical ventilation systems (e.g., tube condensation, mask seal, alarms); 6.3b

preventing nosocomial infection (e.g., ventilator-associated pneumonia [VAP], infection control practices); 6.3c

administering pharmacological agents (e.g., oxygen, bronchodilators, steroids, neuromuscular blocking agents, intubation medications, pulmonary vasodilators); 6.3d

using techniques to promote client safety and support during procedures (e.g., intubation, extubation, chest tube insertion/removal, needle decompression); 6.3e

recognizing indications for changes in ventilatory support (e.g., bag-mask ventilation, mode, airway pressures, PEEP); and 6.3f

managing high frequency oscillatory ventilation (HFOV). 6.3g

implements nursing interventions to prevent and manage complications of mechanical ventilation (e.g., acute lung injury [ALI], oxygen toxicity, barotrauma, DOPE, atelectasis). 6.4

implements nursing interventions to promote successful weaning of ventilatory support (e.g., assessment of readiness, adequate nutrition, fluid status, level of consciousness, pain management). 6.5

## 7. Gastrointestinal System

The critical care pediatrics nurse:

interprets data related to the gastrointestinal system including:

client's health history (e.g., congenital defects, failure to thrive, nutrition and stooling patterns, food allergies); 7.1a

physical assessment (e.g., skin turgor, bowel sounds, distention, quantity/quality of output); 7.1b

nutritional assessment (e.g., growth chart data, body mass index, caloric intake and needs, supplements); 7.1c

laboratory reports (e.g., total protein, liver profiles, albumin, lipid profiles, serum glucose, gastric pH, stool testing); and 7.1d

diagnostic reports (e.g., imaging, swallowing studies). 7.1e

recognizes actual or potential life-threatening alterations to the gastrointestinal function including:

obstructed/ischemic/infarcted/perforated bowel (e.g., necrotizing enterocolitis [NEC]); 7.2a

infection (e.g., gastroenteritis, Clostridium difficile [C. difficile], peritonitis); 7.2b

hepatic function (e.g. biliary atresia, hepatitis); 7.2c

congenital defects (e.g., gastroschisis, cleft palate); 7.2d

gastroesophageal reflux disease (GERD); and 7.2e

toxic ingestions (e.g., drugs, hydrocarbons, caustics). 7.2f

implements nursing interventions to optimize gastrointestinal function including:

- administering early enteral feeding (e.g., positioning, frequency, intestinal or gastric tube insertion/position/care); 7.3a
- administering pharmacologic agents (e.g., histamine-reducing agents, motility enhancers); 7.3b
- managing gastrointestinal bleeding (e.g., pharmacological agents, gastric tubes, lavage); 7.3c
- managing therapeutic diets (e.g., ketogenic, chylothorax, hypo/hypercaloric); and 7.3d
- promoting breastfeeding (e.g., accessing resources for support and education, safe expression/storage of expressed milk). 7.3e

## 8. Renal System

The critical care pediatrics nurse:

interprets data related to the renal system including:

- client's health history (e.g., autoimmune disorders, renal failure, infections); 8.1a
- physical assessment (e.g., fluid status, edema, urine quality/quantity, weight, body surface area, insensible losses); 8.1b
- laboratory reports (e.g., serum and urine electrolytes, creatinine, osmolality, drug levels, urinalysis, blood gas, urea, culture); and 8.1c
- diagnostic reports (e.g., imaging, biopsies, glomerular filtration rate [GFR]). 8.1d

recognizes actual or potential life-threatening alterations in renal function, including:

- pre-renal (e.g., inadequate preload); 8.2a
- intra-renal (e.g., nephrotic syndrome, nephrotoxic agents, acute tubular necrosis, infections); and 8.2b
- post-renal (e.g., neurogenic bladder, renal outflow obstruction). 8.2c

recognizes the sequelae of renal dysfunction (e.g., hypertension, fluid/electrolyte and acid base imbalance, nutritional compromise). 8.3

recognizes indications for and complications of renal replacement therapies (e.g., hemodialysis, continuous renal replacement therapies).	8.4
implements nursing interventions to optimize renal function including:	
administering fluid and pharmacological agents (e.g., volume, diuretics, electrolyte replacements);	8.5a
managing peritoneal dialysis; and	8.5b
using techniques to promote client safety and support during procedures (e.g., insertion of catheters for renal replacement therapy).	8.5c

## 9. Endocrine and Metabolic Systems

The critical care pediatrics nurse:

interprets data related to the endocrine/metabolic system including:

client's health history (e.g., endocrine/metabolic status, familial/genetic disorders, consanguinity);	9.1a
physical assessment (e.g., hydration status, respiratory patterns, neurological assessment, vital signs, weight changes and body mass index [BMI]);	9.1b
laboratory reports (e.g., serum and urine glucose, osmolality, electrolytes, pH and acid base balance, bilirubin, ammonia, lipase); and	9.1c
diagnostic reports (e.g., imaging, genetic screening, biopsies).	9.1d

recognizes actual or potential life-threatening alterations in endocrine/metabolic function including regulation of:

antidiuretic hormone (e.g., diabetes insipidus [DI], syndrome of inappropriate antidiuretic hormone [SIADH]);	9.2a
metabolism (e.g., diabetic ketoacidosis [DKA], hypoglycaemia, inborn errors of metabolism);	9.2b
adrenal corticoid hormones (e.g., adrenal insufficiency); and	9.2c
hepatic and pancreatic functions (e.g., liver failure, pancreatitis).	9.2d

implements nursing interventions to optimize endocrine/metabolic function including:

- administering pharmacological agents (e.g., insulin, steroids, dextrose, antidiuretic hormone, electrolyte replacement, hypertonic saline); 9.3a
- managing parenteral nutrition (e.g., considerations for compatibility, electrolyte imbalances); 9.3b
- managing fluid status and acid base balance; and 9.3c
- managing therapeutic diets (e.g., diabetic, enzyme replacement). 9.3d

## 10. Immunology and Hematology Systems

The critical care pediatrics nurse:

interprets data related to the immunologic and hematologic systems including:

- client's health history (e.g., immune status, blood dyscrasias, oncological disease, post transplant, infection and infectious contacts); 10.1a
- physical assessment (e.g. petechiae, pallor, purpura, bleeding); 10.1b
- laboratory reports (e.g., cultures/viral screening [e.g., HIV/CMV], CBC and differential, coagulation profile, antibody/antigens); and 10.1c
- diagnostic reports (e.g., imaging, biopsies). 10.1d

recognizes actual and potential life-threatening alterations in function including:

- immunological (e.g., burns, transplants, graft vs. host, severe combined immune deficiency syndrome [SCIDS], 22-Q deletion syndrome [DiGeorge syndrome], asplenia, systemic inflammatory response syndrome [SIRS], multi-organ dysfunction syndrome [MODS]); 10.2a
- hematological (e.g., leukemia, sickle cell disease, disseminated intravascular coagulopathy [DIC], neutropenia, heparin-induced thrombocytopenia, thrombosis); and 10.2b
- oncological emergencies (e.g., acute tumour lysis syndrome, hemorrhagic cystitis, myocardial dysfunction, sepsis, superior vena cava syndrome). 10.2c

implements nursing interventions to optimize immunological function including:

- minimizing the risk of and preventing nosocomial infections (e.g., aseptic techniques, infection control practices, nutrition, hygiene); 10.3a
- administering pharmacological agents (e.g., antibiotics, intravenous immunoglobulin [IVIG], immunizations, anti-rejection medications, granulocyte colony-stimulating factor [G-CSF], antiretrovirals); and 10.3b
- promoting immunocompetence (e.g., breastmilk, micronutrients, adequate sleep/rest). 10.3c

implements nursing interventions to optimize hematological function including:

- administering blood and blood products and managing transfusion reactions; 10.4a
- minimizing blood loss (e.g., blood conservation techniques); and 10.4b
- administering pharmacological agents (e.g., anticoagulants, vitamin K, tranexamic acid, protamine, thrombolytics, erythropoietin). 10.4c

## 11. Musculoskeletal and Integumentary Systems

The critical care pediatrics nurse:

interprets data related to the musculoskeletal/integumentary systems including:

- client's health history (e.g., surgical procedures, trauma, altered mobility, age, neurologic status, nutritional and fluid status, infections and infectious contacts); 11.1a
- physical assessment (e.g., skin integrity, range of motion, circulation, sensation, petechiae, mobility, risk of skin breakdown, deformities, device insertion sites); 11.1b
- laboratory reports (e.g., electrolytes, CBC, urine myoglobin, cultures); and 11.1c
- diagnostic test reports (e.g., imaging, skin/muscle biopsy). 11.1d

recognizes actual or potential life-threatening alterations of the musculoskeletal/integumentary systems including:

- compartment syndrome; 11.2a
- burns (e.g., thermal, chemical or radiation, electrical); 11.2b
- wounds (e.g., postoperative, post-trauma, pressure ulcers); 11.2c
- acute skin reactions (e.g., allergic, medication, graft vs. host); and 11.2d
- muscle weakness/paralysis (e.g., pharmacologically induced, neuromuscular disorders, spinal cord injury). 11.2e

implements nursing interventions to optimize musculoskeletal/integumentary function including:

- administering pharmacological agents (e.g., antispasmodics); 11.3a
- performing wound care (e.g., specialized dressings and stoma devices); 11.3b
- preventing and managing complications related to immobility (e.g., positioning, range of motion, therapeutic beds, early mobilization); and 11.3c
- using techniques to promote client safety and support during procedures (e.g., debridement, biopsies, escharotomies). 11.3d