

Exam Blueprint and Specialty Competencies

Introduction – Blueprint for the Critical Care (Adult) Nursing Certification Exam

The primary function of the Blueprint for the CNA Critical Care (Adult) 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 (adult) 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 (adult) 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 CNA Critical Care (Adult) Nursing Certification Exam is a criterion-referenced exam.¹ 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 (Adult) 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

A working group of four highly experienced critical care (adult) nurses from various regions in Canada created the current list of competencies during a five-day meeting. These competencies were reviewed by a group of four critical care (adult) nurses in Eastern Canada and a subsequent group of seven critical care (adult) nurses from Western Canada. The final list of competencies was approved by the Critical Care (Adult) Nursing Certification Exam Committee.

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 critical care (adult) nurses, the following assumptions were made.

Environment

- The health-care facility provides a designated physical environment conducive to the 24-hour delivery of safe and comprehensive care of critically ill adult patients and their families.
- The critical care (adult) environment may exist outside the specifically designated area to adapt to the dynamic needs of the patient population.
- The critical care (adult) environment is characterized by complexity, unpredictability, ambiguity, interprofessional collaboration, use of technology and ethical challenges.

Nurse

- The critical care (adult) nurse is a knowledgeable, educated and skilled health-care professional who provides care to a critically ill adult population in collaboration with other members of the health-care team.
- The critical care (adult) nurse is a leader and pivotal member of the interprofessional health-care team who coordinates and provides timely assessment, care, education, discharge and follow-up.
- The critical care (adult) nurse possesses and uses critical thinking skills to identify and respond in a timely manner to rapidly changing patient, family and environmental situations.
- The critical care (adult) nurse is an advocate for the patient, family and health-care team in ethically, emotionally and morally challenging situations.
- The critical care (adult) nurse maintains professional competence through ongoing education, research and skill development.
- The critical care (adult) nurse prioritizes and incorporates evidence-informed interventions in order to ensure patient safety in all aspects of critical care.

Critical Care Nursing Process

- The critical care (adult) nurse uses the nursing process to assess, plan, intervene, evaluate the plan and revise the care.
- The critical care (adult) nurse recognizes the unique pathophysiology of disease states and implications for care of special populations, within the critical care setting including those with prolonged lengths of stay, pregnant and bariatric patients and older adults.

- The critical care (adult) nurse anticipates and implements interventions for actual or potential life-threatening situations to prevent complications.
- The critical care (adult) nurse develops and coordinates a holistic plan of care in collaboration with the patient, family and interprofessional team.
- The critical care (adult) nurse evaluates and revises the plan of care in timely response to changes in the patient's status.
- The critical care (adult) nurse documents and communicates assessment data, the plan of care, interventions and patient responses or outcomes.
- The critical care (adult) nurse develops a therapeutic relationship with the patient and family reflecting cultural sensitivity and social justice.
- The critical care (adult) nurse supports, facilitates and respects the patient's and family's need for information and participation in the plan of care and decision-making.
- The critical care (adult) nurse uses teaching strategies consistent with the acuity, complexity, readiness, ability and needs of the patient and family.
- The critical care (adult) nurse assesses and facilitates the patient's and family's ability to cope with stressors related to illness and the environment and encourages access to internal and external resources.
- The critical care (adult) nurse maintains a patient's privacy and autonomy in a technological environment.
- The critical care (adult) nurse uses a variety of strategies to assess and manage pain, sleep, sedation and comfort.
- The critical care (adult) nurse promotes and supports research and integrates the best available evidence-informed care into practice, including requirements of organizational practice (ROPs).
- The critical care (adult) nurse understands the importance of providing holistic end-of-life care in collaboration with the patient, family and the interprofessional team.
- The critical care (adult) nurse responds to environmental, physical and psychosocial stressors affecting the interprofessional team in the critical care setting by using available resources (e.g., critical incident, debriefings, employee assistance program).
- The critical care (adult) nurse works as a member of the interprofessional team to facilitate appropriate, timely care and intervenes to ensure a smooth transition of patients and families throughout the critical care continuum.

Patient/Family

- The patient is one who is experiencing an actual or potential life-threatening illness.
- The family is defined by the patient.
- The patient's and family's experience with critical illness is significantly influenced by their environment, culture, spirituality, and lived and learned experience.
- The patient's and family's ability to communicate is often compromised by the health situation or intervention.
- The patient and family are viewed within the biological, psychological, social, cultural, developmental, environmental, experiential and spiritual dimensions.

Health

- Health includes biological, psychological, social, cultural, developmental, environmental and spiritual well-being. Health is a resource for living and is not merely the absence of disease.
- Health exists within chronic illness, disability, frailty and aging.
- Health is the extent to which an individual, group or community is able to realize aspirations and to function in his, her or their environment.
- Health is a personal concept and is viewed within the context of the patient's personal, cultural ethnic and spiritual value system.
- Health behaviour may be directed toward promotion, prevention, maintenance, rehabilitation and restoration, or palliation.

Competency Categories

The competencies are classified under a ten-category classification scheme. Some of the competencies lend themselves to one or more of the categories; therefore, these ten 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

Category	Number of competencies	Percentage of the total number of competencies
Neurologic System	22	12.4%
Cardiovascular System	40	22.5%
Respiratory System	32	17.9%
Gastrointestinal System	18	10.1%
Renal System	8	4.5%
Endocrine System	7	3.9%
Immunology and Hematology Systems	13	7.3%
Musculoskeletal and Integumentary Systems	11	6.2%
Psychosocial	17	9.6%
End of Life	9	5.1%

Competency Sampling

Using the grouping and guidelines, the Critical Care (Adult) 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

Categories	Approximate weights in the total examination
Neurologic System	10-15%
Cardiovascular System	15-25%
Respiratory System	15-25%
Gastrointestinal System	2-12%
Renal System	5-12%
Endocrine System	1-11%
Immunology and Hematology Systems	6-16%
Musculoskeletal and Integumentary Systems	2-12%
Psychosocial	1-5%
End of Life	1-5%

Technical Specifications

In addition to the specifications related to the competencies, other variables are considered during the development of the Critical Care (Adult) 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., patient culture, patient 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 patient's health-care situation). Independent questions stand alone. In the Critical Care (Adult) Nursing Certification Exam, 60 to 65 per cent of the questions are presented as independent questions and 35 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 (Adult) Nursing Certification Exam is aimed at one of three levels: knowledge/comprehension, application or critical thinking.²

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 patient's record).

² 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 patients (e.g., applying nursing principles to the care of patients).

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 (adult) 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 patients.

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 (Adult) Nursing Certification Exam
Knowledge/Comprehension	20-30%
Application	22-32%
Critical Thinking	42-52%

Contextual Variables

Patient Gender and Age: In the development of the critical care (adult) certification exam, questions will include only adult patients (i.e., 16 years and older). The age of the patient will be determined by the presented health situations. The questions will represent both genders.

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

Patient Health Situation: In the development of the Critical Care (Adult) Exam, the patient is viewed holistically. The patient health situations presented also reflect a cross-section of health situations encountered by critical care (adult) nurses.

Health-Care Environment: Critical care (adult) nursing is practised primarily in the hospital setting. However, critical care (adult) nursing can also be practised in other settings. Therefore, for the purposes of the Critical Care (Adult) Exam, the health-care environment is specified only where it is required for clarity or in order to provide guidance to the examinee.

Conclusions

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

It is recognized that critical care (adult) 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 (Adult) Nursing Exam Development Guidelines

Structural Variables	
Exam Length and Format	Approximately 165 multiple-choice questions
Question Presentation	60-65% independent questions 35-40% case-based questions
Cognitive Ability Levels of Questions	Knowledge/Comprehension: 20-30% of questions Application: 22-32% of questions Critical Thinking: 42-52% of questions
Competency Categories	Neurologic System 10-15% of questions Cardiovascular System 15-25% of questions Respiratory System 15-25% of questions Gastrointestinal System 2-12% of questions Renal System 5-12% of questions Endocrine System 1-11% of questions Immunology and Hematology Systems 6-16% of questions Musculoskeletal and Integumentary Systems 2-12% of questions Psychosocial 1-5% of questions End of Life 1-5% of questions
Contextual Variables	
Patient Age and Gender	In the development of the critical care (adult) certification exam, questions will include only adult patients (i.e., 16 years and older). The age of the patient will be determined by the presented health situations. The questions will represent both genders.
Patient Culture	Questions are included that measure awareness, sensitivity and respect for different cultural values, beliefs and practices, without introducing stereotypes.
Patient Health Situation	In the development of the Critical Care (Adult) Exam, the patient is viewed holistically. The patient health situations presented also reflect a cross-section of health situations encountered by critical care (adult) nurses.
Health-Care Environment	It is recognized that critical care (adult) nursing is practised primarily in the hospital setting. However, critical care (adult) nursing can also be practised in other settings. Therefore, for the purposes of the Critical Care (Adult) Exam, the health-care environment is specified only where it is required for clarity or in order to provide guidance to the examinee.

The Critical Care (Adult) Nursing Certification Exam List of Competencies

Neurologic System

The critical care (adult) nurse:

- 1.1 interprets data (initial and ongoing assessment or response to interventions related to the neurologic system), including:
 - 1.1a physical assessment (e.g., vital signs, level of consciousness, Glasgow Coma Scale, sedation scale, cranial nerve assessment, delirium assessment, pain assessment, motor and sensory assessment, pupils, peripheral nerve stimulation [TOF]);
 - 1.1b laboratory results (e.g., osmolality, cerebral spinal fluid [CSF], sodium, arterial blood gases [ABGs], glucose);
 - 1.1c intracranial waveforms and pressures (e.g., troubleshooting inaccurate results, interpreting abnormal findings); and
 - 1.1d cerebral perfusion pressure (e.g., calculation).
- 1.2 understands the rationale for and clinical implications of diagnostic results (e.g., computed tomography [CT or CAT scan], magnetic resonance imaging [MRI], electroencephalogram [EEG], transcranial Dopplers [TCD]).
- 1.3 recognizes actual or potential life-threatening alterations in neurologic function, including:
 - 1.3a ineffective thermoregulation (e.g., hyperthermia, hypothermia);
 - 1.3b motor and sensory dysfunction related to neuromuscular transmission, (e.g., Guillain-Barré syndrome, spinal cord injury, myasthenia gravis, amyotrophic lateral sclerosis [ALS], critical illness, polyneuropathy);
 - 1.3c motor and sensory dysfunction related to brain injury (e.g., stroke, traumatic brain injury);
 - 1.3d cerebral tissue perfusion (e.g., seizures, stroke, altered cerebral metabolism); and
 - 1.3e intracranial hypertension (e.g., traumatic brain injury, hepatic failure, stroke, herniation).
- 1.4 selects the appropriate evidence-informed nursing interventions to minimize or prevent motor or sensory deficits, such as:
 - 1.4a maintaining spinal cord integrity (e.g., positioning, immobilization devices); and

- 1.4b intervening in spinal cord crises: spinal shock, neurogenic shock, autonomic dysreflexia (e.g., alleviating cause, pharmacological agents, positioning, fluids).
- 1.5 selects the appropriate evidence-informed nursing interventions to correct alterations in cerebral tissue perfusion, such as:
 - 1.5a using techniques to prevent obstruction and promote venous and cerebral spinal fluid (CSF) drainage (e.g., positioning, neck alignment, head-of-bed elevation, proper application of collars, tracheostomy ties);
 - 1.5b optimizing PaCO₂;
 - 1.5c administering pharmacological agents (e.g., diuretics, barbiturates, analgesics, sedatives, neuromuscular blocking agents, steroids, vasopressors);
 - 1.5d managing invasive intracranial pressure monitoring or ventricular drainage devices (e.g., set-up, drainage, troubleshooting, positioning of device);
 - 1.5e using techniques that control intrathoracic pressures (e.g., minimizing airway stimulation, pharmacological agents, minimizing positive end-expiratory pressure [PEEP], gastric decompression);
 - 1.5f managing vasospasm (e.g., calcium channel blockers, triple H therapy [hypervolemia, hypertension, hemodilution], positioning);
 - 1.5g managing metabolic rate (e.g., cooling devices or fluids, pharmacological agents, reduced stimulation);
 - 1.5h managing seizure activity (e.g., pharmacological agents, correcting hypoglycemia, correcting electrolytes);
 - 1.5i preventing secondary injury (e.g., maintaining adequate oxygenation, preventing hypercarbia, fluid management, blood pressure management); and
 - 1.5j managing thrombotic stroke (e.g., thrombolytics, blood pressure control, thermoregulation, blood glucose control).

Cardiovascular System

The critical care (adult) nurse:

- 2.1 interprets data (initial and ongoing assessment or response to interventions) related to the cardiovascular system, including:
 - 2.1a physical assessment (e.g., vital signs, pulses, skin temperature and colour, heart sounds, lung sounds, work of breathing, jugular venous distention [JVD]);

- 2.1b laboratory results (e.g., cardiac enzymes and troponin, complete blood count [CBC], coagulation, arterial blood gases [ABGs], electrolytes, digoxin levels, lactate);
 - 2.1c ECG rhythm (e.g., cardiac rhythm, ectope, continuous ST segment monitoring, QT interval);
 - 2.1d 12-lead ECG (e.g., ischemia, infarction, bundle branch blocks);
 - 2.1e right atrial or mixed venous oxygen saturation measurements (e.g., oxygen delivery and consumption);
 - 2.1f information from technological supports (e.g., pacemakers [sensing and capture]);
 - 2.1g pulmonary artery catheter pressures and waveforms (e.g., right ventricular pressure [RVP], pulmonary artery pressure [PAP]);
 - 2.1h atrial pressures and waveforms (e.g., right atrial pressure [RAP], pulmonary artery wedge pressure [PAWP]);
 - 2.1i arterial pressures and waveforms (e.g., radial, femoral); and
 - 2.1j hemodynamic parameters (e.g., cardiac output [CO] and index [CI], systemic vascular resistance index [SVRI], pulmonary vascular resistance index [PVRI]).
- 2.2 understands the rationale for and clinical implications and complications of 15-lead ECG, transesophageal echocardiogram [TEE], transthoracic [2-D echocardiogram], intra-aortic balloon pump and pressures, percutaneous coronary intervention [PCI].
- 2.3 intervenes based on observation of manifestations of the following actual or potential life-threatening alterations in cardiac output and perfusion:
- 2.3a cardiogenic shock (e.g., myocardial infarction, cardiomyopathy);
 - 2.3b hypovolemic shock (e.g., hemorrhage, third space loss);
 - 2.3c distributive shock (e.g., systemic inflammatory response system [SIRS], sepsis, neurogenic shock, anaphalactic shock);
 - 2.3d acute coronary syndrome: myocardial infarction (e.g., STEMI, non-STEMI, unstable angina);
 - 2.3e cardiac tamponade (e.g., cardiac surgery, trauma, pericardial effusion);
 - 2.3f acute cardiac pulmonary edema (e.g., oxygen, pharmacological agents, PEEP);
 - 2.3g hypertension (e.g., post cardiovascular surgery, pheochromocytoma, pregnancy-induced);
 - 2.3h dysrhythmias;

- 2.3i valvular disease (e.g., stenosis, regurgitation, papillary muscle rupture, mechanical or tissue valves); and
- 2.3j heart failure (e.g., systolic, diastolic).
- 2.4 intervenes based on observation of manifestations of the following actual or potential life-threatening alterations of the vascular structure and function:
 - 2.4a aneurysm and/or dissection (e.g., aortic arch, thoracic, abdominal);
 - 2.4b complications from dysrhythmia (e.g., thrombus, low stroke volume, activity intolerance); and
 - 2.4c limb or organ ischemia (e.g., mesenteric infarct, compartment syndrome, sepsis).
- 2.5 selects appropriate evidenced-informed nursing interventions to correct alterations in cardiovascular perfusion, such as:
 - 2.5a administering vasopressors;
 - 2.5b administering vasodilators;
 - 2.5c administering inotropes;
 - 2.5d administering reperfusion therapy (e.g., thrombolytic agents); and
 - 2.5e administering anticoagulants and antiplatelet therapies.
- 2.6 selects appropriate evidence-informed nursing interventions to correct alterations in cardiac output, such as:
 - 2.6a optimizing preload (e.g., fluid administration, pharmacological agents);
 - 2.6b optimizing afterload (e.g., pharmacological agents);
 - 2.6c optimizing contractility (e.g., fluid administration, pharmacological agents);
 - 2.6d optimizing heart rate or rhythm (e.g., fluid management, pharmacological agents, electrolytes);
 - 2.6e optimizing heart rate or rhythm: pacing and cardioversion; and
 - 2.6f managing a cardiac arrest (e.g., advanced cardiac life support [ACLS] protocols, therapeutic hypothermia).
- 2.7 selects appropriate evidence-informed nursing interventions to manage intravascular access devices, such as:
 - 2.7a assisting with invasive procedures (e.g. maximal barrier precautions, site selection, site preparation);

- 2.7b preventing or managing complications (e.g., air embolism, thrombosis, infection, occlusion, hemorrhage, malposition); and
 - 2.7c removal of intravascular access devices: central venous catheters, peripheral arterial lines, femoral arterial lines (e.g., adequate hemostasis, patient positioning, infection prevention, timely removal).
- 2.8 selects appropriate evidence-informed nursing interventions to manage hemodynamic monitoring systems, such as:
- 2.8a managing invasive hemodynamic devices (e.g., set-up, levelling, patency, patient positioning); and
 - 2.8b troubleshooting invasive hemodynamic devices (e.g., inaccurate results, interpreting abnormal findings, waveform interpretation).

Respiratory System

The critical care (adult) nurse:

- 3.1 interprets data (initial and ongoing assessment or evaluating results of interventions) related to the respiratory system, including:
 - 3.1a physical assessment (e.g., respiratory pattern, rate, auscultation, palpation, inspection);
 - 3.1b laboratory results (e.g., arterial blood gases [ABGs], methemoglobins, carboxyhemoglobins);
 - 3.1c monitoring technological devices (e.g., pulse oximetry, end tidal CO₂);
 - 3.1d oxygen value (e.g., PaO₂, SaO₂, SpO₂, oxygen content, PaO₂/FiO₂ ratio);
 - 3.1e knowledge of modes of mechanical ventilations;
 - 3.1f need for ventilatory support (e.g., non-invasive, indications for intubation and ventilation, readiness for discontinuation); and
 - 3.1g ventilation information (e.g., tidal volume, minute volume, respiratory rate, airway pressures, PEEP).
- 3.2 understands the rationale for and clinical implications of diagnostic test results (e.g., chest X-rays, CT scans, bronchoscopies, pulmonary function tests, metabolic assessment).

- 3.3 recognizes an actual or potential life-threatening alteration of the respiratory system, including:
- 3.3a ineffective airway (e.g., asthma, epiglottitis, laryngeal spasm/edema, head/neck trauma, mucous plug);
 - 3.3b ineffective breathing (e.g., Guillain-Barré syndrome, chest trauma, impaired respiratory drive);
 - 3.3c pleural abnormalities (e.g., tension pneumothorax, pleural effusion, hemothorax);
 - 3.3d non-cardiac pulmonary edema (e.g., acute lung injury [ALI], acute respiratory distress syndrome [ARDS]);
 - 3.3e ventilation: perfusion mismatch/perfusion disturbance (e.g., embolism, thrombotic, fat, air, amniotic, atelectasis);
 - 3.3f pulmonary hypertension (e.g., primary, secondary);
 - 3.3g inhalation injuries (e.g., thermal, carbon monoxide, aspiration);
 - 3.3h chronic pulmonary disease (e.g., restrictive, obstructive); and
 - 3.3i pulmonary infections (e.g., febrile respiratory illness, community acquired pneumonia [CAP], health-care associated pneumonia [HAP], ventilator associated pneumonia [VAP], tuberculosis).
- 3.4 selects appropriate evidence-informed nursing interventions to correct alterations in respiratory function, such as:
- 3.4a positioning (e.g., prone, head-of-bed elevation);
 - 3.4b managing airway (e.g., jaw thrust or chin lift, artificial airways);
 - 3.4c administering and titrating oxygen;
 - 3.4d managing the endotracheal tube or tracheostomy (e.g., suctioning, tube placement, tracheobronchial toilet);
 - 3.4e managing secretions (e.g., chest percussion, vibration, postural drainage, assisted cough, rotational therapy, subglottic suction, lung recruitment manoeuvre [breath stacking]);
 - 3.4f administering pharmacological agents to facilitate ventilation (e.g., analgesics, reversal agents, sedatives, paralytics, puffers/aerosol therapy);
 - 3.4g administering pharmacological agents to prevent or treat pulmonary embolism (e.g., thrombolytic agents, anticoagulants);
 - 3.4h administering pharmacological agents to treat pulmonary hypertension and/or hypoxemia (e.g., prostacyclin, nitric oxide);

- 3.4i administering pharmacological agents to optimize airway resistance;
 - 3.4j troubleshooting mechanical supports (e.g., ventilator, continuous positive airway pressure [CPAP] and BiLevel masks);
 - 3.4k recognizing the need for changes to ventilatory support (e.g., oxygenation, tidal volume, PEEP, mode); and
 - 3.4l assisting with medical interventions (e.g., tracheostomy, intubation, chest tube insertion).
- 3.5 selects appropriate evidence-informed nursing interventions to promote return to spontaneous ventilation.
- 3.6 selects appropriate evidenced-informed nursing interventions to optimize oxygenation and ventilation.
- 3.7 selects appropriate interventions to prevent ventilator associated pneumonia (VAP).

Gastrointestinal System

The critical care (adult) nurse:

- 4.1 interprets data (initial and ongoing assessment or response to interventions) related to the gastrointestinal function, including:
- 4.1a physical assessment (e.g., inspection, auscultation, percussion, palpation);
 - 4.1b laboratory results (e.g., liver profile, glucose, amylase, proteins, electrolytes, albumin); and
 - 4.1c monitoring devices (e.g., intra-abdominal and bladder pressure).
- 4.2 recognizes actual or potential life-threatening alterations to the gastrointestinal system, including:
- 4.2a ischemic disorders (e.g., infarcted bowel, hepatic failure, cirrhosis, abdominal compartment syndrome);
 - 4.2b inflammatory disorders (e.g., peritonitis, pancreatitis, hepatitis, C. difficile, Crohn's, colitis);
 - 4.2c mechanical disorders (e.g., esophageal rupture, perforated bowel, ileus);
 - 4.2d hemorrhagic disorders (e.g., upper and lower gastrointestinal bleeding, splenic injuries, hepatic injuries, esophageal varices);

- 4.2e complications of enteral or parenteral feeding (e.g., sinusitis, diarrhea, aspiration, constipation, hyperglycemia, refeeding syndrome); and
- 4.2f malnutrition.
- 4.3 implements the appropriate evidence-informed nursing interventions to manage the patient who has ingested a toxic substance (e.g., acetylsalicylic acid, antidepressants, acetaminophen, toxic alcohols).
- 4.4 selects the appropriate evidenced-informed nursing interventions to correct alterations in gastrointestinal functions, such as:
 - 4.4a promoting early and safe enteral feeding (e.g., indications, patient positioning to prevent aspiration, tube placement, post pyloric feeding tube);
 - 4.4b optimizing parenteral nutrition (e.g., indications, lipid therapy, glucose concentration, selection of access site);
 - 4.4c administering pharmacological agents (e.g., motility enhancers, GI prophylaxis);
 - 4.4d managing ischemic disorders (e.g., infarcted bowel, hepatic failure, cirrhosis, abdominal compartment syndrome);
 - 4.4e managing inflammatory disorder (e.g., peritonitis, pancreatitis, hepatitis, hepatic failure);
 - 4.4f managing mechanical disorders (e.g., esophageal rupture, perforated bowel, ileus);
 - 4.4g managing hemorrhagic disorders (e.g., upper and lower gastrointestinal bleeding, splenic injuries, hepatic injuries, esophageal varices); and
 - 4.4h optimizing bowel functions (e.g., diarrhea, constipation, stoma, fecal management system).

Renal System

The critical care (adult) nurse:

- 5.1 interprets data (initial and ongoing assessment or response to interventions) related to the renal system, including:
 - 5.1a physical assessment (e.g., edema, urine, right atrial pressure [RAP] or pulmonary artery wedge pressure [PAWP], fluid balance, weight); and
 - 5.1b laboratory results (e.g., electrolytes, urine electrolytes, urea, creatinine, urinalysis, serum and urine osmolality, anion gap, drug levels).
- 5.2 understands the rationale for and clinical implications of renal replacement therapy.

- 5.3 recognizes effects of nephrotoxic agents or delayed clearance (e.g., diuretics, vasopressors, antibiotics, radiographic dyes, toxins).
- 5.4 recognizes potential life-threatening alterations in renal function (e.g., acute kidney injury criteria).
- 5.5 selects appropriate evidence-informed nursing interventions to correct electrolyte, acid-base imbalances (e.g., potassium, magnesium, calcium, sodium, phosphate, metabolic acidosis, alkalosis).
- 5.6 selects appropriate evidence-informed nursing interventions to optimize renal function, such as:
 - 5.6a optimizing cardiac output (e.g., fluid management, inotropic agents); and
 - 5.6b administering pharmacological agents.

Endocrine System

The critical care (adult) nurse:

- 6.1 interprets data (initial and ongoing assessment or response to interventions) related to the endocrine system, including laboratory tests (e.g., blood glucose, arterial blood gases [ABGs], thyroid-stimulating hormone [TSH], T4, T3, cortisol, osmolality, electrolytes, urine ketones).
- 6.2 recognizes actual or potential life-threatening alterations in endocrine function, such as:
 - 6.2a antidiuretic hormone (e.g., diabetes insipidus [DI], syndrome of inappropriate antidiuretic hormone [SIADH]);
 - 6.2b hyperglycemia (e.g., ketoacidosis [DKA], hyperglycemic hyperosmolar non-ketotic syndrome [HHNS]); and
 - 6.2c adrenal insufficiency (e.g., primary, secondary, associated with critical illness).
- 6.3 selects appropriate evidenced-informed nursing interventions to correct alterations in endocrine function, such as:
 - 6.3a managing antidiuretic hormone (e.g., diabetes insipidus [DI], syndrome of inappropriate antidiuretic hormone [SIADH]);
 - 6.3b managing hyperglycemia (e.g., ketoacidosis [DKA], hyperglycemic hyperosmolar non-ketotic syndrome [HHNS]); and
 - 6.3c managing adrenal insufficiency (e.g., primary, secondary, associated with critical illness).

Immunology & Hematology Systems

The critical care (adult nurse):

- 7.1 interprets data (initial and ongoing assessment or response to interventions) related to the immunologic and hematologic systems, including:
 - 7.1a laboratory results related to hematology (e.g., CBC: erythrocytes, hemoglobin, hematocrit; coagulation profile: INR, aPTT, platelet count, fibrinogen, disseminated intravascular coagulation [DIC] screen, heparin antibody lactate level); and
 - 7.1b laboratory results related to immunology and inflammation (e.g., complete blood count [CBC], neutrophils, leukocytes, lymphocytes, bands, immunoglobulins, cultures: bacterial, viral and fungal).
- 7.2 recognizes potential risk for infection (e.g., immunosuppression, invasive vascular devices, indwelling drainage devices, malnutrition, intubation, hyperglycemia, skin breakdown, nosocomial infections).
- 7.3 recognizes inflammation and infection (e.g., sepsis syndrome, systemic inflammatory response system [SIRS]).
- 7.4 recognizes the potential life-threatening alterations in the hematologic functions, such as:
 - 7.4a thrombocytopenia (e.g., drug-induced, sepsis, idiopathic thrombocytopenia purpura [ITP], mechanical devices); and
 - 7.4b deep vein thrombosis (DVT) (e.g., identifying at-risk patients, manifestations, diagnostic studies).
- 7.5 selects appropriate evidence-informed nursing interventions to prevent infections (e.g., aseptic technique, adequate nutrition, maximizing infection control practices).
- 7.6 selects appropriate evidenced-informed nursing interventions to manage SIRS/sepsis syndrome (e.g., early goal-directed therapy, fluid and pharmacological therapy).
- 7.7 selects appropriate evidenced-informed nursing interventions to prevent or correct alterations in the hematologic system including:
 - 7.7a venous thrombotic disorders: deep vein thrombosis (DVT), pulmonary thromboembolism, vascular access associated thrombosis;
 - 7.7b arterial thrombotic disorders: cerebral thromboembolism, peripheral arterial thrombosis;
 - 7.7c consumptive coagulopathy (e.g., disseminated intravascular coagulopathy [DIC], heparin-induced thrombocytopenia [HIT]); and
 - 7.7d hemorrhagic disorders (e.g., hemophilia).

- 7.8 identifies infection control risks to patients, families and interprofessional team and takes necessary preventive measures to protect against exposure (e.g., personal protective equipment [PPE], negative pressure room).

Musculoskeletal and Integumentary Systems

The critical care (adult) nurse:

- 8.1 interprets data (initial and ongoing assessment or response to interventions) related to the musculoskeletal and integumentary systems, including:
- 8.1a physical assessment (e.g., skin integrity, risk measurement scale [Braden Scale]); and
 - 8.1b laboratory results (e.g., creatine kinase [CK], arterial blood gases [ABGs], electrolytes, CBC, myoglobin).
- 8.2 understands the rationale for and clinical implications of diagnostic results (e.g., X-rays, compartment pressure, CT scan, MRI, ultrasound).
- 8.3 recognizes actual or potential life-threatening alterations of the musculoskeletal and integumentary systems, such as:
- 8.3a compartment syndrome (e.g., abdominal, limb);
 - 8.3b burns (e.g., thermal, chemical, radiation, electrical);
 - 8.3c wounds (e.g., postoperative wounds, post trauma wounds, decubitus ulcers, necrotizing fasciitis); and
 - 8.3d fractures (e.g., long bone, skull, pelvis, ribs, crush injuries, blood loss).
- 8.4 selects the appropriate evidence-informed nursing interventions to correct alterations of the musculoskeletal and integumentary systems, such as:
- 8.4a administering pharmacological agents (e.g., antibiotics, analgesics, sedatives); and
 - 8.4b managing rhabdomyolysis (e.g., fluid, pharmacological agents, monitoring CK or myoglobin, renal replacement therapy [RRT]).
- 8.5 selects appropriate evidence-informed nursing interventions to encourage mobilization and prevent complications related to immobility (e.g., range of motion, positioning, therapeutic surfaces, coughing, deep breathing, wound care, splinting, mobilization, minimal restraints, fall prevention).
- 8.6 selects appropriate evidence-informed nursing interventions in the management of complex wounds (e.g., vacuum-assisted wound drainage, packing, burn dressing, pharmacological agents, skin graft).

Psychosocial

Communicating with the patient and/or family

The critical care (adult) nurse:

- 9.1 interprets data (initial and ongoing assessment or response to interventions) related to each patient's and/or family's psychosocial needs, including:
 - 9.1a experience of the health crisis (e.g., coping skills, hopelessness, powerlessness, grief, loss, culture, spirituality); and
 - 9.1b response to the health-care system (e.g., current and past experiences).
- 9.2 selects appropriate evidenced-informed nursing interventions to facilitate optimal communication, such as:
 - 9.2a providing opportunities for patient- and family-centred decision-making (e.g., end-of-life decisions, advance directives, transplantation, plan of care); and
 - 9.2b providing alternative methods of communication (e.g., use of Passy-Muir valve, communication board, cuff deflation, written communication, interpreter).
- 9.3 selects appropriate evidence-informed nursing interventions to facilitate optimal family processes such as:
 - 9.3a facilitating communication among patient, family, interprofessional team and external resources (e.g., family meetings);
 - 9.3b involving family in direct patient care (e.g., assisting with basic care, family presence);
 - 9.3c supporting the patient and/or family during decision-making and plan of care (e.g., interprofessional rounds);
 - 9.3d advocating for the patient (e.g., advance directives, organ donation, informed consent, privacy, allow natural death [AND]);
 - 9.3e advocating for family presence (e.g., visiting, interprofessional rounds, crisis management); and
 - 9.3f consulting with internal and/or external resources (e.g., social work, ethics consult, community support).

Promoting comfort

The critical care (adult) nurse:

- 9.4 interprets assessment data (initial and ongoing assessment or response to interventions) related to:
 - 9.4a pain (e.g., vital sign changes, body language, pain intensity scale, precipitating and palliative factors, quality, radiation/referral, associated signs and symptoms, time, understanding/experience); and
 - 9.4b level of arousal (e.g., sedation scale, agitation scale, delirium assessment).
- 9.5 selects appropriate evidence-informed nursing interventions to promote comfort, such as:
 - 9.5a non-pharmacological methods of managing discomfort (e.g., alternative therapies, spiritual care, promoting sleep);
 - 9.5b pain management strategies (e.g., continuous and intermittent analgesia, epidural, patient-controlled analgesia [PCA], multi-modal approach);
 - 9.5c sedative administration (e.g., selection, titration); and
 - 9.5d delirium prevention (e.g., manipulation of the environment, promoting sleep, pharmacological agents, consideration of causes).
- 9.6 selects appropriate evidence-informed nursing interventions to manage substance withdrawal (e.g., minimal use of restraints, alleviation of seizures and delirium tremens).

End of Life

The critical care (adult) nurse:

- 10.1 understands indications for transition to end-of-life care (e.g., patient data, advance directives, patient and family wishes, medical futility, legal considerations).
- 10.2 enables transition to end-of-life care (e.g., communication, advocating for patient and family wishes, conflict resolution).
- 10.3 understands criteria for:
 - 10.3a determination of neurological death and/or cardiac death; and
 - 10.3b organ and/or tissue donation.
- 10.4 selects appropriate evidence-informed nursing interventions to provide care in preparation of organ donation (e.g., maintaining hemodynamic stability, comfort care, symptom relief, diagnostic testing).

- 10.5 selects appropriate evidence-informed nursing interventions to provide end-of-life care including:
 - 10.5a providing palliative care strategies (e.g., pain and symptom management);
 - 10.5b supporting family (e.g., encouraging family presence, grieving, spiritual and cultural practices); and
 - 10.5c coordinating with internal and/or external support resources (e.g., spiritual care, ethics, grief support, social work, legal consult).
- 10.6 selects appropriate evidence-informed nursing interventions for withdrawal of treatment (e.g., palliation, family support, family education, cultural and spiritual implications).