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Surgical Critical Care Program Directors Society

Surgical Critical Care Training Curriculum

Developed by the Surgical Critical Care Program Directors Society

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A. Administration and quality improvement objectives

The fellow should be able to:

Patient Care:

- Demonstrate competency in the implementation of different clinical protocols to the care of critically ill patients
- Demonstrate competency in the implementation of institutional quality improvement protocols to the care of critically ill patients
- Demonstrate competency in the implementation of methods for monitoring patient outcomes, and reporting complications

Medical Knowledge:

- Know the difference between a protocol and guideline, and demonstrate competency in their development and implementation
- Understand standards of critical care practice for physicians
- Be familiar with critical care nursing standards of care
- Understand the institutional and regional disaster management protocols
- Develop an understanding of financial management of the intensive care unit, including the monitoring of costs, charges, appropriate coding, billing, and collection
- Understand appropriate federal and state regulations and laws that apply to critical care practice, and develop a basic understanding of the medicolegal aspects
- Appreciate the concept of equitable, logical, ethical and fair allocation of limited resources
- Understand the criteria used for faculty recruitment and advancement
- Understand the criteria used for recruitment and retention of nursing staff and ancillary personnel

Practice-Based Learning and Improvement:

- Understand the importance of multimodality care
- Appreciate the role of effective communication strategies, and leadership skills
- Understand the different styles and roles of critical care practice in open, closed and consultative units
- Understand the role of critical care units in the health system

Interpersonal and communication skills:

- Develop and demonstrate an ability to communicate effectively with members of multi-modality critical care team
- Develop and demonstrate strategies for conflict resolution
- Demonstrate leadership skills

Professionalism:

- Develop effective relationships with consultants, surgeons, nurses and other health care providers
- Demonstrate sound ethical principles
- Understand the need for the enforcement of quality control measures

System-based Practice:

- Understand the need for developing and implementing effective patient safety protocols
- Understand the need for developing and implementing quality improvement measures
- Understand the need for developing and implementing tools for tracking clinical outcomes
- Understand the need for developing and implementing methods for ensuring physician training, maintenance of skills, credentialing and testing
- Active participation in quality improvement activities

B. Burns objectives

The fellow should be able to:

Patient Care

- Demonstrate knowledge and competency in the initial evaluation and management of the patient with thermal injury (early airway management, burn severity)
- Demonstrate knowledge and competency in the evaluation of burn size (using Rule of 9's and Lund-Browder charts) and depth
- Demonstrate knowledge and competency in the management of the patient with inhalation injury including physical examination, analysis of arterial blood gas and carboxyhemoglobin data, airway management, application of hyperbaric oxygen and interventions including
    - Bronchoscopy
- Demonstrate knowledge and competency in selection and rate of administration of resuscitation fluids and application of other therapies in resuscitation
- Demonstrate knowledge and competency in wound care and selection of appropriate wound care modalities
- Demonstrate knowledge and competency in prevention of early burn-associated complications including eschar-related respiratory insufficiency and the appropriate use of escharotomy
- Demonstrate knowledge and competency in the appropriate management of patients with electrical burns including arrhythmias, tissue injury, compartment syndrome and rhabdomyolysis
- Demonstrate knowledge in the appropriate management of patients with chemical burns including prevention of absorption, and recognition of potential pulmonary and renal toxicities
- Demonstrate knowledge and competency in the management of the patient with burn-related hypermetabolism
- Demonstrate knowledge in the evaluation and management of patients with Stevens-Johnson syndrome, toxic epidermal necrolysis syndrome (TENS)
- Demonstrate knowledge and competency in the evaluation of burn wound etiology and the consideration of intentional injury

Medical Knowledge

- Understand the pathophysiology of inhalational injury and demonstrate competence in its diagnosis and management including ventilator strategies and use of adjunct measures
- Understand the pathophysiology and differences between partial and full-thickness burns and minor and major burns
- Understand the different wound management strategies (early versus delayed excision, various topical measures) and their relative strengths and weaknesses
- Understand the early and long-term metabolic effects of major burns and strategies to address this including appropriate use of pharmacology, wound management, temperature control, and nutritional therapies
- Understand the different etiologies of electrical injuries (AC, DC, lightning) and associated injury patterns and complications
- Understand the significance of different types of chemical exposure (acid versus alkali, petrochemical absorption) and strategies for managing topical and systemic effects

- Understand the causes of Stevens-Johnson syndrome and TENS and appropriate diagnosis and treatment strategies

Practice-based Learning and Improvement

- Describe measures and techniques for improving quality of care and patient and family satisfaction
- Review published information critically to understand current evidence-based information to optimize resuscitation, (e.g.. fluid selection), problem-specific management (e.g., TENS, chemical injury)

Interpersonal and Communication Skills

- Demonstrate effective communication with nurses, pharmacists, respiratory therapists, speech, occupation and physical therapists and consulting services for collaborative management of the thermally injured patient
- Demonstrate effective communication with patients and family members both listening and conveying information with appropriate degree of complexity

Professionalism

- Demonstrate respect, compassion, integrity and responsiveness to the needs of the patients and their families
- Approach and discusses ethical issues including advanced directive and end of life issues
- Demonstrate accurate self-assessment, knowledge of professional limits and an ongoing desire for self-improvement

Systems-based Practice

- Serve as an advocate for quality patient care with due attention to costs and resources in a complex health care system including acceptance of transfers and arranging repatriation
- Partner appropriately with other health care providers, including consulting physicians, nurses, pharmacists, respiratory, physical and speech therapists, etc
- Collaborate with other health care providers including consulting physicians, nurses and social workers to evaluate and refer issues related to intentional injury

C. Cardiovascular objectives

The fellow should be able to:

Patient Care:

- Demonstrate knowledge and competency in the interpretation and application of data from non-invasive and invasive, diagnostic and monitoring techniques (e.g. echocardiography, arterial catheters, central venous pressure monitors, pulmonary artery catheter, tissue perfusion monitors, and other methods for measuring cardiac performance)
- Demonstrate competency in the appropriate selection and effective use of different inotropic and vasoactive agents in patients with different types of shock (cardiogenic, neurogenic, septic, or mixed)
- Display a logical approach towards goal directed resuscitation and optimization of tissue oxygen delivery in patients with shock
- Display competency in selecting and using appropriate mechanical support devices in patients with cardiogenic shock (e.g. ventricular assist device, intra-aortic balloon pump) or poor oxygenation (extra corporeal membrane oxygenation)
- Demonstrate an ability to interpret radiographic studies including chest X-rays, CT scans, arteriograms, and magnetic resonance studies, and apply the data to the management of patients with cardiovascular diseases
- Develop competency in performing cardiovascular procedures, including:
    - Ultrasound to diagnose pericardial tamponade
    - Pericardiocentesis
    - Closed and open cardiac compression
    - Placement of arterial and venous catheters for hemodynamic monitoring and/or delivery of therapies
    - Placement of temporary pacemakers
- Demonstrate knowledge and competency in the diagnosis and management of cardiac arrhythmias and ischemic events
- Demonstrate knowledge and competency in the appropriate application of advanced cardiac support (ACLS) guidelines
- Demonstrate competency in diagnosis and management of arterial diseases due to various etiologies (e.g. thrombotic, embolic, arthrosclerosis, aneurismal etc)
- Competency in appropriate control of high blood pressure in various patient populations (e.g. aortic aneurysm, dissections, intra cerebral bleeding)
- Demonstrate competency in the diagnosis and management of various venous diseases including, DVT, venous insufficiency, venous ulcers/gangrene.
- Demonstrate appropriate selection and application of various prevention strategies for thromboembolic events including sequential compression devices, drugs, and caval filters

Medical Knowledge:

- Demonstrate competency in the interpretation of cardiac data obtained from EKG, catherization, echocardiography, and various monitoring devices
- Understand the different arterial and venous diagnostic studies

- Know the different etiologies, diagnostic work up, and management strategies for different types of shock
- Understand the concepts of oxygen content, delivery, and consumption, and develop a logical approach towards their correction in critically ill patients
- Understand the various risk factors, and specific strategies for decreasing peri-operative myocardial adverse events
- Know the various causes of acute and chronic cardiac failure and their treatment
- Know the different types of cardiac arrhythmias and their appropriate treatment
- Know the different types of cardiac valve diseases, and appropriate diagnostic and treatment strategies
- Know the different causes of arterial insufficiency and/or occlusion and their treatment
- Know the different types of arterial aneurysms/dissections and various treatment options
- Know the causes of venous insufficiency and their treatment
- Know the etiologies of thromboembolic events and different strategies for their prevention and treatment
- Understand the rationale and the appropriate use of different cardiovascular tools, including:
    - Ultrasound and echocardiography
    - Cardiac assist devices
    - Cardiopulmonary bypass and Extra corporeal membrane oxygenation (ECMO) equipment
    - Pacemakers
    - Hemodynamic monitoring devices
- Understand the techniques for weaning patients from mechanical cardiac support/ECMO, and for titrating cardiac drugs
- Develop a good understanding of the new literature related to cardiovascular diseases related to critically ill surgical patients

<u>Practice-Based Learning and Improvement</u>:

- Understand the effectiveness of strategies for the prevention, diagnosis, and treatment of thromboembolic complications
- Understand the effectiveness of strategies for the prevention, diagnosis, and treatment of perioperative adverse cardiac events
- Appreciate the effectiveness of protocols for the prompt diagnosis and treatment of cardiac arrhythmias
- Review and understand the evidence-based recommendation for the management of patients with shock

<u>Interpersonal and communication skills</u>:

- Demonstrate effective communication skills with nurses, technicians, and physicians that are involved in the care of patients with cardiovascular diseases
- Ability to develop effective management plans in collaboration with the surgeons and other consulting services for patients with cardiovascular diseases

<u>Professionalism:</u>

- Develop effective relationships with consultants, surgeons, nurses and other health care providers

- Demonstrate sound ethical principles in the care of critically ill patients that refuse cardiovascular support, and/or request withdrawal of care
- Develop compassionate and effective methods for communicating with patients and their family members

System-based Practice:

- Understand the role and cost effectiveness of DVT/PE prevention protocols in the intensive care unit
- Understand the role and cost effectiveness of cardiac ischemic event prevention protocols in the intensive care unit
- Understand the role and cost effectiveness of surveillance protocols for the early diagnosis and treatment of DVT/PE in critically ill patients

D. Endocrine objectives

The fellow should be able to:

Patient Care:

- Demonstrate knowledge and competency in the evaluation and management of critically ill patients with thyroid, parathyroid, pancreatic and adrenal disorders
- Demonstrate knowledge and competency in the evaluation and management of postoperative complications for thyroid, parathyroid, pancreatic and adrenal operations, including acute airway emergencies associated with neck exploration, hypocalcemia from parathyroid operations, and fluid collections and fistulas associated with pancreatic and adrenal operations
- Demonstrate knowledge and competency in the evaluation and management of hyperglycemia and diabetes
- Demonstrate knowledge in the evaluation and management of endocrine insufficiencies secondary to pituitary operations

Medical Knowledge:

- Explain the neuro-endocrine axis in response to stress
- Discuss the hemodynamics associated with hypothyroidism, hyperthyroidism and adrenal insufficiency
- Discuss thyroid storm and its therapy
- Discuss the role of thyroid replacement in euthyroid sick syndrome
- Explain the components of MEN I and II syndromes
- Discuss therapy for hypercalcemia
- Explain the post operative complications of thyroid and para thyroid operations
- Describe the role of HA1c in operative patients
- Describe the treatment of diabetic ketoacidosis and hyperglycemic coma
- Contrast the pros and cons of glucose control in the ICU
- Explain therapy of pheochromocytoma
- Debate the issues of steroid replacement for adrenal insufficiency in the critically ill

Practice-Based Learning and Improvement:

- Measure the effectiveness of glucose control
- Observe the effectiveness of steroid replacement strategies
- Review evidence-based recommendations for steroid and glucose control

Interpersonal and Communication Skills:

- Demonstrate effective team communication between nurses, pharmacists and physicians (including endocrinologists) to manage glucose control in patients
- Develop effective plan of care with surgeons, endocrinologists, and nurses for patients with endocrine problems

Professionalism:

- Develop effective relationships with consultants, surgeons, nurses and pharmacists

System-based Practices:

- Evaluate the role and cost effectiveness of glucose control protocol in critically ill patients
- Demonstrate awareness of the roles of the intensivists, endocrinologists and clinical pharmacists
- Evaluate the outcome and cost effectiveness of steroid replacement

E. Ethics and palliative care objectives

The fellow should be able to:

Patient Care:

- Demonstrate awareness of own feelings, attitudes, and beliefs about death and dying.
- Demonstrate ways to integrate ethics and palliative care into curative care.
- Demonstrate empathy to patients during critical illness.
- Demonstrate management of pain and other symptoms during critical illness.
- Demonstrate understanding of determining goals of care.
- Demonstrate understanding of advanced care planning, specifically roles of decision-maker and advance care directives.
- Demonstrate skills required to resolve conflicts between and amongst families and medical care-givers.
- Demonstrate effective concern over patient privacy.
- Demonstrate effective communication to patients and their families.
- Demonstrate understanding of traditions, beliefs and practices among major religions, cultures and ethnic groups and their effect on medical decision making.
- Demonstrate an understanding of end-of-life issues.

Medical Knowledge:

- Explain the difference between “Hospice” and “palliative care”
- Explain the trajectories of the dying process and how surgical disease affects this.
- Explain the guidelines used to determine prognosis.
- Explain the non-pharmacological and pharmacological management of pain and other associated end-of-life symptoms (such as, nausea, dyspnea, cough, excessive secretions, etc.).
- Explain how to determine goals of care.
- Explain the difference between euthanasia and physician assisted suicide.
- Define medical futility.
- Explain the methods of pronouncing a patient dead.
- Define the manifestations of normal grieving.

Practice-Based Learning And Improvement:

- Identify the best practice patterns to facilitate care of the terminally ill.

Interpersonal and Communication Skills:

- Demonstrate appropriate understanding and effective communication with patients and their families.
- Demonstrate effective communication with all members of the medical care team.

Professionalism:

- Demonstrate proper performance of all expected professional responsibilities.

Systems-based Practice:

- Evaluate and demonstrate cost-effectiveness of diagnostic and management individualized to each critically ill patient.
- Evaluate and define the roles of various health care professionals when providing end-of-life care.
- Able to effectively and appropriately utilize hospital based resources for conflict resolution in the care of critically ill, such as optimal care/ethics committees etc
- Demonstrate consultation skills by identifying specific patient needs or concerns for which social work or a palliative care service would be appropriate.

F. Gastrointestinal objectives

The fellow should be able to:

Patient Care:

- Know how to distinguish upper from lower GI bleeding sources.
- Know how to resuscitation patients with GI bleeding
- Know the indications for urgent or emergent endoscopy for upper GI bleeding.
- Know the various endoscopic techniques for control of upper GI bleeding as they apply to the various causes of upper GI bleeding.
    - Injection
    - Sclerosis
    - Heater probe
    - Clips/banding
- Know the indications for bleeding scans and arteriography for localization of GI bleeding.
- Be familiar with potential interventional techniques that can be performed during arteriography such catheter based infusions and embolization for control of GI bleeding.
- Understand the causes and medical management of liver failure.
- Know the causes and treatment of hepatic encephalopathy
- Know the indications and how to place a Sengstaken-Blakemore tube for bleeding esophageal varacies.
- Know the acute medical management of bleeding varacies.
- Know the complications and management of splenic vein thrombosis and left sided portal hypertension.
- Know the indications and complications for the placement of a Transjugular Intrahepatic Portosystemic Shunt (TIPS).
- Know how to manage hepatorenal syndrome.
- Know the causes, differential diagnosis and management of ileus.
- Know the workup and indications for the neostigmine “challenge” for colonic pseudo obstruction.
- Know the workup and management of patients with bowel ischemia
- Know how to identify patients at risk for the development and know the workup and management of acalculus cholecystitis.
- Demonstrate a thorough knowledge of the management of pancreatitis including interpretation of CT scan findings, signs of pancreatic necrosis and abscess, indications for needle aspiration, controversies regarding phophylactic antibiotics and indications and timing of surgical debridement of the pancreas.
- Know the signs, symptoms and management of ascending cholangitis.

Medical Knowledge:

- Know the causes of upper GI bleeding.
- Know the causes of lower GI bleeding.
- Know the incidence, epidemiology and indications to treat H. pylori.
- Know the pathophysiology and medical and surgical treatment of stress gastritis and Cushing’s ulcers.
- Know the pathophysiology and management of Mallory-Weiss tears and Dieulafoy lesions.
- Know the various etiologies of bowel ischemia and different management strategies.

- Understand the epidemiology, treatment and infectious disease precautions of C. difficile.
- Understand the pathophysiology, management and surgical indications of colonic pseudo obstruction and toxic megacolon.
- Understand the causes and types of hepatorenal syndrome.
- Know the causes of pancreatitis and the cellular pathophysiology of the disease process.
- Understand the role of various systemic agents in the control of upper GI bleeding.

Practice Based Learning and Improvement:

- Understand that there are numerous controversies in the critical care literature and be familiar with how to research various topics and base treatment on best evidence-based practices available.
- Understand best demonstrated practices for stress ulcer prophylaxis and be able to establish protocols relevant to stress ulcer prophylaxis in the ICU environment.
- Know what an ICU "bundle" is and be familiar with recommended standards of care as they pertain to GI medicine.

Interpersonal and Communication Skills:

- Understand the role of the surgical intensivist as a GI consultant and develop open lines of communication with the primary team regarding patient status and necessary treatments and interventions.
- Understand the importance of nursing concerns and incorporate nursing input into a team building ICU environment.

Professionalism:

- Demonstrate how effective leadership skills on the part of the surgical intensivist can broaden the scope of GI practice in the ICU environment.
- Demonstrate broad-based knowledge of gastroenterology and interact effectively with nursing and other ancillary personnel to enhance their understanding of treatment and patient care.

Systems Based Practice:

- Understand the factors that govern the availability of critical resources such as the GI lab and skilled personnel, and appreciate that these factors are often institution specific.
- Understand that the surgical intensivists and GI physicians may have similar scopes of practice and that these services can compliment each other in improving patient care.
- Understand how developing standardized care plans and ICU policies will improve outcomes and develop consistent referral patterns.

Use resources such as skills labs and courses effectively to learn various endoscopic techniques.

G. Hematology objectives

The fellow should be able to:

Patient Care:

- Demonstrate knowledge and competency in the evaluation and assessment of WBC, RBC, and platelet disorders affecting critically ill patients
- Demonstrate knowledge and competency in the evaluation and assessment of Bleeding and clotting disorders in critically ill patients
- Demonstrate knowledge and competency in the management of critically ill patients with WBC, RBC and platelet disorders
- Demonstrate knowledge and competency in the management of critically ill patients with bleeding and clotting problems
- Recognize the clinical presentation of HITT and fat emboli syndrome

Medical Knowledge:

- Explain normal hemostasis and the clotting cascade
- Discuss common abnormalities and effects of common medications on hemostasis and the clotting cascade
- Explain the difference between surgical bleeding and coagulopathy
- Review laboratory tests used for bleeding and clotting abnormalities and be familiar with the use of thromboelastograph in the assessment of coagulopathy
- Discuss massive transfusion, its complications and therapy
- Explain the benefits and risks of transfusion
- Explain the risks and benefits of epogen, recombinant Factor VIIa
- Discuss VTE prophylaxis, diagnosis and treatment of VTE
- Know and discuss the indications for vena cava filter placement
- Discuss pulmonary embolism diagnosis and treatment
- Explain the etiology and management of HITT and alternatives to heparin
- Compare the pharmacology of medications for anticoagulation

Practice-Based Learning and Improvement:

- Observe the effectiveness of transfusion protocol and be familiar with the literature regarding transfusion ratios of PRBCs to FFP and platelets
- Observe the effectiveness of risk stratification on VTE

Interpersonal and communication skills:

- Demonstrate effective communication with the surgeon, ICU team, blood bank and hematologist

Professionalism:

- Demonstrate the importance of obtaining informed consent for transfusions
- Demonstrate ethical principles in the care of Jehovah Witness patients

System-based Practice:

- Evaluate the cost effectiveness of transfusion triggers and VTE prophylaxis
- Understand the importance of a quality improvement system for a massive transfusion protocol

H. Infectious diseases objectives

The fellow should be able to:

Patient care:

- Demonstrate a working knowledge of the workup of the febrile patient in the Surgical ICU.
- Demonstrate an understanding of the workup of ventilator associated pneumonia (VAP)
- Demonstrate an understanding of the diagnosis , management and differences between sepsis, SIRS and septic shock
- Demonstrate an understanding of the diagnosis and management of meningitis.
- Demonstrate an understanding of the diagnosis and treatment of invasive line infections
- Demonstrate a working knowledge of the care and treatment of the patient with necrotizing soft tissue infection.
- Demonstrate an understanding of invasive burn wound sepsis and infections occurring in patients with thermal injury
- Demonstrate an understanding of the diagnosis and management of primary, secondary and tertiary peritonitis.
- Demonstrate an understanding of the pathophysiology, diagnosis and management of acalculous cholecystitis.
- Demonstrate an understanding of the etiologies, diagnosis and management of intra-abdominal abscesses.
- Demonstrate an understanding of the difference between and indications for prophylactic, empiric and therapeutic antibiotic choices, as well as appropriate drug selection for specific clinical situations. Have knowledge of monitoring of antibiotic levels and appropriate dose adjustment
- Demonstrate knowledge of the workup of nonbacterial sources of infections such as fungus, viral, and other unusual pathogens in ICU patients.
- Demonstrate an understanding of the special considerations in immunosuppressed patients like HIV, diabetic patients, and patients with cirrhosis

Medical knowledge:

- State the etiology and the pathogenesis of septic shock in the Surgical ICU patient including potential causative organisms
- Explain the principles of antibiotic management in detail including antibiotic selection, potential adverse affects of treatment and appropriate length of treatment
- List the risks factors for ventilator associated pneumonia and potential preventative strategies based on evidence-based guidelines
- Discuss the risk factors for line sepsis and develop a management strategy using evidence based guidelines to evaluate and treat patients with line infections.
- Evaluate the risk factors for CNS infection patients with brain injury including the specific issues associated with invasive brain monitoring devices
- Discuss the risk factors for the development of and management of the patients with peritonitis.
- Evaluate and treat patients with intra-abdominal abscesses in the ICU.
- Discuss the risk factors for development of urinary tract infections in the ICU patient.
- Understand the risk factors and the care of the patient with complex necrotizing soft tissue infection.
- Discuss the risk factors for fungal, viral infections in the ICU patient

Patient-based learning and improvement:

- Recognize when a patient is not responding to treatment and when it is time to change antibiotic strategy including stopping antibiotic treatment when appropriate.

Interpersonal and communication skills:

- Demonstrate the ability to communicate with infectious disease consultants in a clear and concise fashion
- Demonstrate the ability to appropriately order microbiological tests and interpret the results

Systems-based practice

- Demonstrate knowledge of the specific antibiotic resistance patterns at the hospital and in the ICU setting
- Demonstrate knowledge of resistance patterns in the patient population.
- Demonstrate the ability to make cost-effective antibiotic selections

I. Monitoring and bioengineering objectives

The fellow should be able to:

Patient care:

- Demonstrate knowledge of the indications for central venous catheter monitoring
- Demonstrate monitoring
- Demonstrate venous access
- Demonstrate competency in central venous catheter placement
- Demonstrate knowledge of the indications for pulmonary artery catheter monitoring.
- Demonstrate competency in pulmonary artery catheter placement
- Demonstrate understanding of the mechanics of measurement of cardiac output
- Demonstrate understanding of oxygen delivery and consumption and therapeutic implications of abnormalities in these parameters as well as appropriate therapeutic interventions.
- Demonstrate knowledge of the indications for arterial catheter monitoring
- Demonstrate competency in arterial catheter placement
- Demonstrate knowledge of the technical aspects of monitoring ("how it works")
- Demonstrate knowledge of the effects of transducer positioning on pressure readings.
- Demonstrate knowledge and competency in setting up and troubleshooting a pressure transducer line.

Medical knowledge

- Demonstrate knowledge of the complications (immediate and subsequent) of central venous access and competence in recognition and management of these complications
- Demonstrate knowledge of the complications of invasive arterial access and competence in recognition and management of these complications

Systems based practice

- Demonstrate knowledge of the controversies and literature–based evidence regarding the use of pulmonary artery catheters
- Demonstrate knowledge of developing hemodynamic monitoring technologies in the care of the critically ill patient

J. Neurological objectives

The fellow should be able to:

Patient Care:

- Demonstrate appropriate and timely evaluation and management of acute neurological decompensation.
- Demonstrate appropriate utilization and interpretation of brain and spinal cord imaging.
- Demonstrate an understanding of algorithms for clinical clearance of spine injuries
- Demonstrate appropriate understanding and interpretation of information from monitors of intracranial pressure, neurophysiology (including electroencephalography and evoked potentials), brain tissue oxygenation, and cerebral blood flow.
- Demonstrate appropriate management of extra-cerebral parameters to minimize risk of secondary brain injury.
- Demonstrate knowledge and competency in the evaluation and non-operative management of severe closed head injury.
- Demonstrate appropriate and timely evaluation and management of patient with anoxic encephalopathy.
- Demonstrate knowledge of the diagnosis and treatment of abnormalities of sodium homeostasis related to neurologic diseases, including diabetes insipidus, Syndrome of Inappropriate Anti-Diuretic Hormone, and cerebral salt wasting.
- Demonstrate proper assessment and management of the patient with a stroke, both ischemic and hemorrhagic.
- Demonstrate proper assessment and management of the patient with subarachnoid hemorrhage, including prevention and management of cerebral vasospasm.
- Demonstrate the proper assessment and management of patients with intracranial hypertension, including evaluation of data from intracranial pressure monitors or extra-ventricular drains.
- Demonstrate proper assessment and management of patients with spinal cord injury, including airway and hemodynamic management.
- Demonstrate appropriate consultation with consultants in physical medicine and rehabilitation and with rehabilitation facilities.
- Demonstrate proper performance of brain death certification.
- Demonstrate basic principles of support for potential organ donors.

Medical Knowledge:

- State the etiology and describe the pathophysiology of patients with severe closed head injury and intracranial hypertension.
- List the risks, benefits, indications, and contraindications for ICP monitor or extra-ventricular drain placement and describe the possible limitations and complications of these devices.
- State the etiology and describe the pathophysiology of patients with spinal cord injury.
- Understand the importance of physical therapy, occupational therapy, and rehabilitation in optimizing patient outcomes from central nervous system and spinal cord injury.
- Know the risk factors for blunt cerebrovascular injury, clinical presentations, evaluation and treatment options
- Describe the initial evaluation and management of patients with suspected meningitis. List the most likely organisms.

- Describe predictive and outcome scales used to describe neurologic diseases, e.g., Glasgow Coma Scale, Hunt and Hess Scale for subarachnoid hemorrhage, National Institutes of Health Stroke Scale, and Glasgow Outcome Scale).
- State the etiology and describe the pathophysiology of patients with imminent brain death and brain dead potential donors.
- Describe the indications, limitations, and general process of brain death evaluation and certification. List the adjunctive tests for determining brain death and describe the indications and limitations of their use.

Practice-Based Learning And Improvement:

- Identify the best practice patterns to facilitate care of the critically ill patient with severe neurological injury or dysfunction from operating procedures and patient interactions.

Interpersonal And Communication Skills:

- Demonstrate effective communication with staff, peers, attending and referring physicians, consultants, and representatives from the local organ procurement organization.
- Establish a collegial rapport with patient and family
- Demonstrate effective discussion of patient diagnoses, prognosis, and management plan (including end of life decisions) with patient and family using simple, easily understood language.

Professionalism:

- Demonstrate the practice of ethical principles in relation to patient care including obtaining informed consent, implementing "Do Not Resuscitate" orders, withholding or withdrawing life support, and clarifying goals of care from advance directives.

Systems-Based Practice:

- Demonstrate consultation skills by identifying a specific need or question when communicating with palliative care or ethics consultants and the organ procurement organization.
- Demonstrate awareness of the role of the ICU, organ procurement organizations, and the transplantation service.

K. Nutritional objectives

The fellow should be able to:

Patient Care:

- Demonstrate knowledge and competency in the evaluation and assessment of the nutritional needs of critically ill surgical patients.
- Demonstrate knowledge and competency in the management of enteral and parenteral nutrition.
- Demonstrate knowledge and competency in the placement of nasogastric and nasointestinal feeding tubes.
- Demonstrate knowledge and competency in the placement of percutaneous endoscopic gastrostomies, open and laparoscopic gastrostomies and jejunostomies.

Medical Knowledge:

- Explain the catabolic and anabolic phases of the response to injury, including the mediators involved in these responses.
- Explain the methods of determining resting caloric needs for patients, including the Harris-Benedict equation and indirect calorimetry.
- Explain the factors that increase caloric requirements of critically ill surgical patients, including surgical stress, trauma, cancer, sepsis, and previous nutritional status.
- Explain estimates of protein stores and protein requirements, including measurement of specific serum proteins and determination of nitrogen balance.
- Compare and contrast the risks and benefits of enteral nutrition compare to parenteral nutrition.
- Explain the potential electrolyte and glycemic complications of enteral and parenteral nutrition.
- Explain the risks involved in placement of enteral access devices, including transnasal, endoscopic, and surgical devices.
- Understand the potential use of nutritional support for specific organ system dysfunction.
- Understand the principles involved in immuno- or pharmaco-nutrition.
- Explain the impact of nutritional status on wound healing.

Practice-Based Learning And Improvement:

- Observe the effectiveness of the prescribed nutritional support by following parameters of nutritional status.

Interpersonal and Communication Skills:

- Demonstrate effective communication with nutritionists, respiratory care, and nursing staff to determine the patients' nutritional needs and to implement the plan of care.

Professionalism:

- Demonstrate proper performance of all expected professional responsibilities.

Systems-based Practice:

- Evaluate and demonstrate cost-effectiveness of nutritional support in critically ill patients

Demonstrate consultation skills by identifying specific patient needs or questions for which nutritionist consultation would help and provide efficient and effective patient care.

L. Obstetrical objectives

The fellow should:

Patient Care

- Demonstrate knowledge regarding the management of the pregnant patient with critical illness not related to pregnancy
- Demonstrate knowledge of pregnancy-related conditions including pre-eclampsia/eclampsia, HELLP syndrome, gestational cardiomyopathy, amniotic fluid embolism, peripartum hemorrhage (placenta previa, placental abruption), pulmonary edema
- Demonstrate the ability to appropriately select radiographic studies to maximize maternal and fetal wellbeing in the management of the pregnant patient who is critically ill
- Understand the management of obstetrical hemorrhage including coagulopathy, DIC and massive transfusion

Medical Knowledge

- Understand the physiologic changes (including respiratory, cardiovascular, renal and gastrointestinal) associated with pregnancy, delivery and the immediate post-partum period
- Understand how the physiologic changes of pregnancy impact critical care management including hemodynamic, pulmonary, pharmacologic, and selection of imaging studies
- Understand the pathophysiology of fetal oxygenation and appropriate monitoring strategies
- Know the pathophysiology, diagnosis and management of pregnancy-related conditions potentially requiring critical care intervention including pre-eclampsia and eclampsia, HELLP syndrome, gestational cardiomyopathy, amniotic fluid embolism, peripartum hemorrhage (placenta previa, placental abruption), pulmonary edema
- Know the risks of fetal demise related to maternal diagnosis and condition
- Understand the impact of pregnancy and post-partum states on the appropriate selection of different pharmacological agents.

Practice-based Learning and Improvement

- Describe measures and techniques for improving quality of care and patient and family satisfaction
- Review published information critically to understand current evidence-based information regarding pregnancy-specific conditions (pre-eclampsia, eclampsia) and those complicating pregnancy (septic shock, thromboembolic disease)

Interpersonal and Communication Skills

- Demonstrate effective communication with obstetrical colleagues, nurses, respiratory therapists and consulting services for collaborative management of the peripartum patient
- Demonstrate effective communication with patients and family members both listening and conveying information with appropriate degree of complexity

Professionalism

- Demonstrate respect, compassion, integrity and responsiveness to the needs of the patients and their families, particularly with regard to potential pre-term delivery or fetal demise
- Demonstrate accurate self-assessment, knowledge of professional limits and an ongoing desire for self-improvement

Systems-based Practice

- Serve as an advocate for quality patient care with due attention to costs and resources in a complex health care system
- Collaborate with other health care providers, including consulting physicians, nurses, pharmacists, respiratory, physical and speech therapists, etc in the development and implementation of ICU protocols for the obstetrical patients.

M. Pediatric objectives

The fellow should be able to:

Patient Care

- Demonstrate appropriate and timely evaluation of pediatric patients with acute respiratory decompensation, including asthma.
- Demonstrate appropriate and timely evaluation of pediatric patients with shock
- Demonstrate knowledge of techniques for intubation of infants and children.
- Demonstrate knowledge of techniques for vascular access procedures in infants and children.

Medical Knowledge

- Discuss the ventilator management strategies in children including PRVC and HFOV
- Discuss the methods for evaluation and treatment of children with cardiac arrhythmias.
- Discuss the management of shock in infants and children with attention to age-related differences within the pediatric age range and as compared to adult patients
- Discuss the role of extracorporeal circulation for pulmonary and/or cardiac support in children.
- Discuss effects and management of caustic and toxic ingestions.
- Discuss methods of dialysis of children including CVVH, hemodialysis, and periotoneal dialysis.
- Discuss findings suggestive of child abuse and appropriate intervention.
- Discuss the basic issues of law and ethics specific to pediatric critical care

Practice-Based Learning And Improvement

- Identify the best practice patterns to facilitate care of the critically ill child.

Interpersonal and Communication Skills

- Demonstrate appropriate understanding and effective communication with children, parents and their families.

Professionalism

- Demonstrate proper performance of all expected professional responsibilities.

Systems-based Practice

- Evaluate and demonstrate cost-effectiveness of diagnostic and management in critically ill children.
- Demonstrate consultation skills by identifying specific patient needs or concerns for which pediatric and child protective services would help and provide efficient and effective patient care.
- Demonstrate knowledge of potential child abuse and how to access appropriate resources within the healthcare environment to assist the child.

N. Pharmacology objectives

The fellow should be able to:

Patient care:

- Demonstrate appropriate choice of medications and adjustments in medication dosing based upon the principles of drug absorption, distribution, metabolism, and excretion.
- Demonstrate appropriate identification and management of potential drug interactions.

Medical knowledge:

- Explain the principles of pharmocokinetics and pharmacodynamics.
- Explain patient factors that affect drug metabolism, including renal dysfunction, hepatic dysfunction, obesity, and critical illness

Patient-based learning and improvement:

- Recognize potential adverse drug effects and drug interactions in the critically ill patients.

Interpersonal and communication skills:

- Appreciate the role played by a pharmacologist on a multi-disciplinary ICU team.
- Demonstrate effective communication skills when consulting pharmacologists.

Professionalism:

- Demonstrate professional interactions with the pharmacology staff.

Systems-based practice:

- Demonstrate the importance of determining cost-effectiveness when choosing medications.
- Appreciate the importance of developing intensive care unit guidelines/protocols for appropriate pharmacological agents.

O. Renal objectives

The fellow should be able to:

Patient Care:

- Demonstrate appropriate management of oliguria in the critically ill.
- Demonstrate appropriate management of electrolytes, intravascular volume status, and drug dosing in patients with acute renal failure.
- Describe the nutritional requirements of patients with acute and chronic renal failure in the ICU.
- Describe the relative and absolute indications for renal replacement therapies.
- Understand the principles of the different modes of dialysis and solute transport.

Medical Knowledge:

- Understand the basic physiology and anatomy of the kidney.
- Understand the definition of acute renal failure, including anuric, oliguric, and high output renal failure.
- Describe the causes of acute oliguria, including prerenal, intrinsic, and postrenal causes.
- Understand the pathogenesis and cellular mechanisms ATN including necrosis and apoptosis and "phases" of relevant cytokines.
- Understand the blood flow distribution and oxygen tension in the renal cortex and outer and inner medulla and how these factors affect susceptibility during ischemic insult.
- Be familiar with the pathologic changes that occur in the tubule from insult to recovery.
- Understand the phases of ATN.
- Describe the incidence, risk factors, prevention strategies and treatment of contrast nephropathy.
- Understand what impact acute renal failure has on mortality rates in the ICU.

Practice Based Learning:

- Understand the controversies between conventional hemodialysis and continuous renal replacement therapy in the ICU environment.

Interpersonal and Communication Skills:

- Coordinate care between the dialysis staff and critical care nursing.
- Develop a treatment plan for dialysis in coordination with the renal medical service and other patient care issues.
- Effectively communicate prognosis with family relative to degree of organ failure.

Professionalism:

- Coordinate the management of ICU patients with ARF.

Systems Based Practice:

- Understand staffing issues pertaining to ICU patients requiring dialysis or continuous renal replacement therapy.

- Understand the pros and cons of dialysis in the ICU versus in the dialysis unit.

P. Respiratory objectives

The fellow should be able to:

Patient Care:

- Demonstrate knowledge and competency in the interpretation and application of arterial blood gas data
- Demonstrate knowledge and competency in the appropriate use of different ventilator settings in mechanically ventilated patients
- Display competency in selecting the appropriate mechanical ventilation mode based on specific patient needs
- Demonstrate familiarity with trouble shooting the ventilator, and strategies to ensure that patients are adequately ventilated and oxygenated
- Demonstrate the ability to interpret radiographic data including chest X-rays, and CT scans and application of data to clinical management plans
- Demonstrate knowledge and competency in performing respiratory system related procedures, including:
    - Bronchoscopy
    - Tracheostomy/cricothyodotomy
    - Intubation
    - Pleural drainage
- Demonstrate knowledge of difficult airway characteristics and advanced methods for intubation of the difficult airway
- Demonstrate knowledge and competency in the diagnosis and management of patient with pulmonary infections including pneumonia, ventilator associated pneumonia, empyema, lung abscess, tracheobronchitis etc
- Demonstrate knowledge and competency in the diagnosis and management of pulmonary dysfunction in critically ill patients
- Demonstrate competency in the appropriate application of various weaning strategies to mechanically ventilated patients

Medical Knowledge:

- Demonstrate competency in the interpretation of radiographic tests
- Understand the significance of the different components of pulmonary function tests
- Know the different etiologies, diagnostic work up, and management strategies for acute lung injury (ALI) and acute respiratory distress syndrome (ARDS)
- Know the methods for the prevention, diagnosis and treatment of pneumonia
- Know the causes of acute respiratory failure, hypoxia, and hypercarbia
- Understand the rationale and demonstrate competency in the appropriate use the different ventilator modalities, including:
    - Continuous positive airway pressure (CPAP)
    - Pressure support
    - Synchronized intermittent mandatory ventilation (SIMV)
    - Controlled minute ventilation and inverse I:E ratio
    - Airway pressure release ventilation (APRV)
    - Non-invasive ventilation modes

- Understand the various methods of weaning patients from mechanical ventilation, and the rationale behind selecting the appropriate strategy
- Develop a good understanding of the new literature related to respiratory problems such as pneumonia, ALI, ARDS, and mechanical ventilation

Practice-Based Learning and Improvement:

- Understand the effectiveness of strategies for the prevention of pneumonia and ventilator associated pneumonia in critically ill patients
- Appreciate the effectiveness of different ventilator weaning strategies
- Review and understand the evidence-based recommendation for the management of patients with ARDS including the role of pharmacologic agents
- Review and understand the evidence-based recommendation for the diagnosis, treatment and prevention of pulmonary infections

Interpersonal and communication skills:

- Demonstrate effective communication with nurses, respiratory therapist and physicians that are involved in the management of patients with respiratory failure and/or pulmonary infections
- Develop effective management plan in collaboration with the surgeons and other consulting services for patients with respiratory failure and/or pulmonary infections

Professionalism:

- Develop effective relationships with consultants, surgeons, nurses and respiratory therapists
- Demonstrate sound ethical principles in the care of critically ill patients that refuse respiratory support, or request withdrawal of care
- Develop compassionate and effective methods for communicating with patients and their family members

System-based Practice:

- Understand the role and cost effectiveness of pneumonia prevention protocols in the intensive care unit
- Understand the role and cost effectiveness of early diagnosis and aggressive treatment of pneumonia in critically ill patients
- Understand the rationale behind the development and implementation of protocols for weaning mechanical support in ventilated patients
- Demonstrate awareness of the role of the respiratory therapists in the management of patients with respiratory failure

Q. Statistics objectives

The fellow should be able to:

Patient Care:

- Demonstrate an understanding of the importance of evidence based medicine.
- Demonstrate an understanding of the skills required to critically evaluate new knowledge.
- Demonstrate the ability to critically evaluate medical literature.
- Demonstrate an understanding of the epidemiology of surgical disease process and how this impacts patient care.
- Demonstrate an understanding of morbidity and mortality and how this affects cost and outcome.
- Demonstrate an understanding of the variables used to calculate and the application of scoring systems (such as APACHE II, ISS, NISS).
- Demonstrate an understanding of the importance of various prediction models (such as TRISS).

Medical Knowledge:

- Explain the principles of evidence based medicine.
- Demonstrate understanding of the differences between retrospective, prospective, randomized, and blinded clinical trials.
- Explain how to grade and evaluate evidence.
- Explain and understand basic statistical comparisons, including t-test, chi-square, and analysis of variance.
- Explain and understand logistic regression modeling and the association between factors.

Practice-Based Learning And Improvement:

- Appropriately apply statistical methodology to the interpretation and understanding of evidence based practice.
- Demonstrate the ability to select statistically valid evidence from the literature which will improve the care of critically ill patients.

Interpersonal and Communication Skills:

- Demonstrate appropriate understanding and effective communication of evidence based practice.

Systems-based Practice:

- Demonstrate an understanding of how evidence based practice plays a role in the management of critically ill patients.
- Understand how to incorporate Level 1 data into practice change for patient care.

R. Transplantation objectives

The fellow should be able to:

Patient care:

- Demonstrate knowledge of the management of patients with acute and chronic liver failure including hepatic encephalopathy, gastrointestinal bleeding, infections, hepatorenal and hepatopulmonary syndromes, and large volume ascites production
- Demonstrate knowledge of management of patients with portal hypertension including indications for and complications of portal-systemic shunts (e.g., Transjugular Intrahepatic Portal-systemic Shunts)
- Demonstrate knowledge of the management of patients with gastrointestinal bleeding including placement of esophagogastric balloon tamponade devices
- Demonstrate knowledge of management of unique surgical challenges encountered in patients with liver failure including chronic malnutrition, delayed wound healing, electrolyte derangements (hyponatremia, hyperaldosteronism) and the effects of chronic steroid and/or immunosuppressant use
- Demonstrate appropriate and titrated pre- and post-operative care for the patient with fulminant hepatic failure with specific focus on the management of encephalopathy, intracranial pressure, and oxygen delivery to the brain.
- Demonstrate appropriate management of infection and surgical decision making in the immunocompromised patient.

Medical knowledge:

- Describe pathophysiologic changes in acute and chronic liver failure
- Describe the long term effects of steroid and/or immunosuppresants use, including chronic malnutrition, electrolyte derangements (hyponatremia, hyperaldosteronism)
- Describe the cardiovascular and hemodynamic consequences of end-stage liver disease
- State the various etiologies, describe the pathophysiology, demonstrate the appropriate management and evaluate outcome of patients with liver failure-related organ dysfunction, specifically hepatic encephalopathy, hepato-renal syndrome, and hepato-pulmonary syndrome.
- Describe the pathogenesis of altered cerebral blood flow and intracranial hypertension in fulminant hepatic failure and both diagnostic monitoring and management strategies
- Describe management rationale, demonstrate care, and evaluate outcomes of post-operative patients from liver, kidney, pancreas, small bowel, and multivisceral abdominal transplant surgery, as well as portal-systemic shunts.
- Compare and contrast diagnostic evaluations and treatment plans for potential infections in patients who are immunocompetent versus immunosuppressed.
- List the opportunistic infections that can occur in patients with liver transplant and demonstrate knowledge of these infections by ordering appropriate diagnostic testing for them.
- Describe the mechanisms of action and major toxicities of immunosuppressive agents used in solid organ transplantation.

Practice Based Learning:

- Understand application of the Model For End-Stage Liver Disease (MELD) and Pediatric End-Stage Liver Disease (PELD) scores and the basics of organ allocation by United Network for Organ Sharing (UNOS)

Interpersonal and Communication Skills:

- Demonstrate effective team leadership strategies in communicating with families, nursing staff, organ procurement organizations.

Professionalism:

- Demonstrate professional interactions with members of organ procurement organizations.

Systems-Based Practice:

- Demonstrate familiarity with the UNOS System.

S. Trauma objectives

The fellow should:

Patient Care:

- Demonstrate knowledge and competency in the initial assessment, triage and resuscitation of injured patients
- Demonstrate knowledge and competency in airway assessment, and management including
    - Rapid sequence intubation (RSI)
    - Cricothyroidotomy
- Demonstrate knowledge and competency in recognizing and managing thoracic injury including simple and tension pneumothorax, [massive] hemothorax, rib fractures and flail chest, pulmonary contusion, and great vessel injury and procedures including:
    - Needle chest decompression
    - Tube thoracostomy
- Demonstrate knowledge and competency in indications and performance of emergency department thoracotomy
- Demonstrate knowledge and competency in the use of crystalloids and appropriate use of blood products for resuscitation and implementation of the massive transfusion protocol
- Demonstrate familiarity with the advantages and disadvantages of endpoints of resuscitation: vital signs including physical exam findings, base deficit, lactate, oxygen delivery and consumption
- Demonstrate knowledge and competency in type and placement of vascular access, and use of massive transfusion devices
- Demonstrate knowledge and competency in the diagnosis of intra-abdominal injury including the use of
    - Focused abdominal sonography in trauma (FAST) exam
    - Diagnostic peritoneal lavage
- Demonstrate knowledge and competency in the recognition and management of abdominal compartment syndrome and temporary abdominal closure techniques
- Demonstrate knowledge and competency in the diagnosis and management of pelvic fractures including recognition of associated injuries
- Demonstrate knowledge and competency in the management of patients with traumatic brain injury, spinal cord injury and blunt cerebrovascular injury including the selection and use of intracranial pressure monitoring devices and Licox monitors
- Demonstrate competency in appropriate timing and selection of radiographic studies in the evaluation of the injured patient
- Demonstrate the ability to interpret radiologic and laboratory data to develop comprehensive management plans
- Demonstrate knowledge and competency of specific trauma patient populations: pediatric, geriatric and obstetrical

Medical Knowledge:

- Understand the importance and significance of mechanism of injury in the care of the injured patient
- Know and understand the differences between blunt and penetrating mechanisms of injury

- Understand the specific concerns in the care of the injured pediatric, geriatric or obstetrical patient
- Know the principles of initial trauma evaluation and management
- Understand the different types of thoracic injury and appropriate management strategies for each including initial and subsequent interventions
- Understand the principles and practice of non-operative management of solid abdominal organ injury including AAST injury grading scales
- Know the causes and recognition of elevated intra-abdominal pressure, abdominal compartment syndrome as well as principles and complications of temporary abdominal closure
- Know the pathophysiology of various types of traumatic brain injury (including epidural, subdural, intraparenchymal hemorrhage, diffuse axonal injury) and prevention of secondary brain injury
- Understand the pathophysiology of intracranial hypertension and its management including the use of ICP monitoring devices, extraventricular drains, and operative intervention
- Understand the considerations in the management of patients with CNS injury including fluid selection, nutrition, management of coagulopathy, DVT prophylaxis and complications including diabetes insipidus and SIADH
- Understand the mechanisms for blunt cerebrovascular injury, clinical signs and symptoms and its diagnosis and treatment
- Know the pathophysiology of spinal cord and spinal column injury and clinical presentation, diagnosis and management including complications
- Understand clinical issues associated with spinal cord injury: cardiovascular considerations, ventilator considerations, tracheostomy, DVT prophylaxis, skin integrity, contracture
- Understand and demonstrate competence in the management of patients with extremity fractures including optimal timing of fracture fixation, recognition of associated vascular and neurologic injuries, recognition and prevention of compartment syndrome
- Know the complications associated with extremity injuries including rhabdomyolysis, fat embolism syndrome, compartment syndrome
- Understand the evaluation and management of the patient with a mangled extremity, including the use of appropriate scores and adjunctive measures
- Understand the significance of different types of pelvic fractures, and demonstrate competency in management of associated injuries (urethral, open fractures)
- Know the indications for and complications of blood component therapy and application of massive transfusion principles

<u>Practice-based Learning:</u>

- Describe measures and techniques for improving trauma system performance including review of specific indicators (e.g. delay to operative intervention)
- Review published information critically to understand current evidence-based information to optimize resuscitation, (e.g. fluid selection, BP control), select appropriate radiographic imaging, problem-specific management (e.g. thoracic aortic injuries, prevention of secondary brain injury)

<u>Interpersonal and Communication Skills:</u>

- Demonstrate effective communication with emergency medicine colleagues, nurses, respiratory therapists and consulting services for collaborative management of the injured patient
- Demonstrate effective communication with patients and family members both listening and conveying information with appropriate degree of complexity
- Develop collaborative relationships with consulting services for optimizing the timing of interventional procedures

Professionalism:

- Demonstrate respect, compassion, integrity and responsiveness to the needs of the patients and their families
- Approaches and discusses ethical issues including advanced directive and end of life issues
- Demonstrates accurate self-assessment, knowledge of professional limits and an ongoing desire for self-improvement

Systems-based Practice:

- Understand cost-effective patient care in a tertiary- care hospital setting
- Effectively participate in triage decision-making in the setting of multiple casualties
- Serve as an advocate for quality patient care with due attention to costs and resources
- Partner appropriately with other health care providers, including consulting physicians, nurses, pharmacists, respiratory, physical and speech therapists, etc
- Understand the role of discharge planning and selection of appropriate discharge venue (rehabilitation facility vs skilled nursing facility vs home)

T. Ultrasound objectives

The fellow should be able to:

Patient care:

- Demonstrate knowledge and competency in the evaluation and management of critically ill patients using ultrasound
- Basic principles Knowledge and skills required for competence in general critical care ultrasonography (GCCU) include the following:
    - Knowledge of basic ultrasound physics. An understanding of the fundamental principles of ultrasound physics is required to obtain high quality images and to understand and recognize artifacts of ultrasound imaging.
    - Knowledge of machine controls and transducer manipulation to enable the fellow to personally perform the ultrasound examination at bedside
    - Knowledge of normal and abnormal ultrasound anatomy, and the pathophysiological implications of the imaged abnormality.
    - Knowledge of image interpretation, clinical applications, and specific limitations of ultrasonography.
    - Understanding of the limitations of the technical and interpretive capabilities of the technology and the fellow performing the study Frequently, GCCU is performed as a limited or goal-directed examination. with the goal of answering the clinical question with a definitive positive or negative result. The fellow must also have the knowledge to identify an indeterminate result and an appropriate response.

Practice-Based Learning and Improvement:

- The fellow should incorporate the ultrasound use in daily practice
- Specific ultrasonographic examinations in which the fellow should achieve competence include:
    - Echocardiography
        - Global LV size and systolic function
        - Wall motion abnormalities
        - Global RV size and systolic function
        - Assessment for pericardial fluid/tamponade
        - Basic color Doppler assessment for massive valvular regurgitation
    - Hemodynamic evaluation
        - IVC size and respiratory variation
        - Cardiac SV estimation
        - CVP estimation
        - Detection of aortic dissection
        - Pulmonary edema
    - Lung and pleural ultrasonography
        - Presence or absence of pneumothorax
        - Detection of pleural effusion
        - Diaphragmatic dysfunction
        - Pulmonary edema
    - Abdominal ultrasonography
        - FAST exam

        - Extended FAST
    - Vascular ultrasonography: guidance of vascular access
    - Vascular ultrasonography: diagnosis of venous thrombosis

Interpersonal and Communication Skills:

- Demonstrate effective team communication between nurses,respiratory therapists, pharmacists and physicians to plan for patients care using ultrasonographic exam results
- Develop effective plan of care with surgeons and nurses for patients with problems diagnosed using ultrasound in the unit

Professionalism:

- Develop effective relationships with consultants, surgeons, nurses and pharmacists, respiratory therapist.

System-based Practices:

- Evaluate the role and cost effectiveness of using ultrasound protocol in critically ill patients
- Demonstrate awareness of the role of the radiologist, and cardiologist in the management of patients when ultrasound result are inconclusive
- Evaluate the outcome and cost effectiveness of using ultrasound in the intensive care unit for patient management