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| **Patient Care 1: Pre-anesthetic Patient Evaluation, Assessment, and Preparation**  |
| Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
| Performs general histories and physical examinations.Identifies clinical issues relevant to anesthetic care with direct supervision. | Identifies disease processes and medical issues relevant to anesthetic care.Obtains necessary laboratory tests and radiologic studies. Recognizes need for blood and blood products and orders appropriately. On the day of surgery examines patient and reviews the chart for important changes. Updates preoperative evaluation and discusses with attending physician. | Performs basic neurological examination including level of consciousness, cranial nerves, motor and sensory function.Identifies disease processes and medical or surgical issues relevant to Neuroanesthesia including but not limited to:- myelopathy/cord compression vs radiculopathy- elevated ICP/impending brain herniation- hemodynamic goals and their significance- extracranial manifestations of intracranial disease (e.g. cardiac complications in SAH, endocrine and electrolyte imbalance disorders).Reviews relevant neuroimaging (CT, MRI, Angiogram etc.) with assistance.Anticipates need for neurophysiologic monitoring based on patient’s pathology and planned procedure.Seeks guidance in identifying unusual clinical problems and their implications for anesthesia care. | Performs assessment, risk stratification and optimization (with consultation as indicated) of complex or critically ill neurosurgical patients without missing major issues that impact anesthesia care with conditional independence.Incorporates relevant neurological grading systems in preoperative assessment (e.g. Glasgow Coma Scale score, Hunt & Hess grade, Fisher grade).  | Independently performs comprehensive assessment for all patients.Independently serves as a consultant to other members of the health care team regarding optimal pre-anesthetic preparation. |
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| **Patient Care 2: Anesthetic Plan and Conduct** |
| Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
| Formulates patient care plans that include consideration of underlying clinical conditions, past medical history, and patient, medical, or surgical risk factors.Adapts to new settings for delivery of patient care. | Formulates anesthetic plans for patients undergoing routine procedures.Conducts routine anesthetics, including management of commonly encountered physiologic alterations associated with anesthetic care, with indirect supervision. | Formulates anesthetic plans for patients undergoing basic neurosurgical procedures. Plans for:- rational use of anesthetic agents- invasive monitoring- appropriate hemodynamic and ventilation goals - intraoperative brain relaxation and ICP control - neurophysiologic monitoring- patient position and equipment needed to accomplish positioning -smooth emergence with neurological assessment.Conducts basic Neuroanesthesia care with indirect supervision, but may require direct supervision for more complex procedures and patients. | Formulates anesthetic plans for patients with complex medical issues undergoing complex neurosurgical / interventional neuroradiology procedures with conditional independence. Plans for special equipment, drugs and techniques that may be needed (e.g. induced hyper-tension, burst suppression, adenosine cardiac standstill). | Independently formulates anesthetic plans that include consideration of medical, anesthetic, and surgical risk factors, as well as patient preference, for complex patients and procedures.Conducts complex anesthetics independently. |
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| **Patient Care 3: Peri-procedural Pain Management** |
| Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
| Recognizes and initiates management of common pain states; seeks advice for management of pain that does not respond to routine therapies. | Manages uncomplicated peri-procedural pain with indirect supervision; requests direct supervision for complex pain situations. | Recognizes post-operative pain management goals accounting for the neurological condition.Obtains accurate history of the patient’s preoperative opioid and sedative medication use. Plans for management of the patient’s acute surgical pain and chronic pain with indirect supervision. Employs multimodal analgesia (e.g. gabapentin, ketamine, NSAIDs etc.) before, during and after surgery as appropriate.Demonstrates understanding of scalp block anatomy. | Manages complex peri- procedural pain for all patients, including those with chronic pain (e.g. patients undergoing complex spinal fusion surgery and microvascular decompression for trigeminal neuralgia), with conditional independence. Performs scalp block for awake neurosurgical procedures independently. Requests pain medicine consultation when appropriate, to address complex pain management issues or co-existing chronic pain states that are not responsive to usual management strategies. | Independently manages peri- procedural pain states. |
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| **Patient Care 4: Crisis Anticipation and Management** |
| Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
| Recognizes acutely ill or medically deteriorating patients; initiates basic medical care for common acute events; calls for help appropriately. | Constructs prioritized differential diagnoses that include the most likely etiologies for acute clinical deterioration:- Hypotension, hypertension - Bradycardia, tachycardia- Hypoxemia- Unexpected hyper- or hypocapnia- Dysrhythmia, ECG ischemia- Patient movement.Initiates treatment with indirect supervision and seeks direct supervision appropriately.  | Anticipates and identifies relevant clinical crises; effectively participates in the management under direct supervision:- Intraoperative brain swelling and increased intracranial pressure- Neuromonitoring signal changes-Hemodynamic changes due to manipulation of the brainstem or carotid sinus-Aneurysm rupture in the operating room or interventional radiology-Venous air embolism-Massive hemorrhage during intracranial or spine procedures- Perioperative seizures- Postoperative complications (e.g. respiratory failure and acute changes in neurological status).Uses cognitive aids appropriately in crisis management. | Anticipates, identifies and manages clinical crises appropriately with conditional independence; assumes increasing responsibility for leadership of crisis response team. | Coordinates crisis team response.Designs and implements protocols for the management of clinical crises. |
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| **Patient Care 5: Management of the Critically Ill Patient during Transport.** |
| Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
| Performs a focused evaluation of the critically ill patient; monitors patient’s clinical status to identify acute changes and trends; communicates pertinent findings to supervisor. Participates in development and initiation of a management plan as directed by supervisor.  | Identifies relevant critical disease processes requiring urgent or emergent intervention (hemodynamic instability, specific ventilation requirements, combative patient etc.).Develops, implements, and appropriately modifies management plan based on patient’s response with direct supervision.  | Identifies critical neurological parameters that require attention during transport (ICP, CPP, optimal MAP and ETCO2etc.).Identifies specific devices and monitors that require special attention during transport (external ventricular drain, lumbar drain, ICP monitor, brain tissue oxygen monitor etc.).Identifies appropriate support personnel, equipment and medications necessary for safe patient care. Prioritizes management of clinical problems with indirect supervision.  | Identifies appropriate procedures and coordinates transport of the complex neurosurgical patient efficiently with conditional independence.Defines clinically appropriate priorities in emergencies, and when resources are limited.Manages specific devices and monitors that require special attention during transport (external ventricular drain, lumbar drain, ICP monitor, brain tissue oxygen monitor etc.) and intervenes appropriately with conditional independence.Supervises other members of the health care team.  | Independently manages, coordinates and leads the urgent transport of the neurosurgical patient in critical condition; sets clinically appropriate priorities when resources are limited. Independently manages acute changes in clinical condition during transport of critically ill patient.Serves as a consultant to other members of the health care team regarding transport and transfer of care considerations.  |
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| **Patient Care 6: Technical skills: Airway Management** |
| Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
| Recognizes airway obstruction and inadequate ventilation based on clinical assessment.Positions patient for airway management; places oral and nasal airways; performs bag- valve-mask ventilation. | Applies knowledge of the ASA difficult airway algorithm to prepare equipment and supplies for airway management.Performs basic airway management in patients with normal airways, including endotracheal intubation, supraglottic airways, and video laryngoscopy.Assesses for and recognizes mainstem intubation after change in positioning.Recognizes need for advanced airway management and seeks appropriate help. | Manages airway with specific attention to the neurological condition (avoiding hypoxia / prolonged hypercarbia, deleterious hemodynamic responses and ICP changes during intubation)Prepares appropriate equipment and supplies for management of difficult airways. Has appropriate back-up plan.Recognizes when awake intubation is needed. Prepares patient for and performs awake intubation techniques under supervision (e.g. fiberoptic). Recognizes need for and applies in-line stabilization correctly.Secures airway considering patient position during surgery.Extubates appropriately while avoiding coughing, straining and hemodynamic changes. | Identifies and corrects problems and complications associated with airway management (e.g., airway hemorrhage) with conditional independence.Prepares patient for and performs awake intubation techniques with conditional independence (e.g. fiberoptic). Manages airways, including under special situations (e.g. trauma, loss of airway), with conditional independence. | Independently assesses and manages the airway for all clinical situations utilizing appropriate advanced airway techniques, including cricothyroidotomy.Independently supervises and provides consultation to other members of the health care team for airway management. |
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| **Patient Care 7: Technical skills: Use and Interpretation of Monitoring and Equipment** |
| Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
| Demonstrates the correct use of standard ASA monitoring devices.Interprets data from standard monitoring devices, and recognizes artifacts. | Performs pre-anesthetic equipment and machine checks.Inserts arterial and central venous catheters with direct supervision.Demonstrates use of ultrasound for placement of arterial and venous catheters.Interprets data from arterial and central venous catheters.Recognizes and appropriately troubleshoots malfunctions of standard ASA monitoring equipment and anesthesia machines. | Inserts arterial catheters with conditional independence and central venous catheters with indirect supervision and with due attention to the selection of appropriate site and side.Performs guideline based, appropriate management of CSF drainage devices. Knows how and when to turn off, and how to calibrate an EVD.Uses data from neuromonitoring devices (EEG, SSEP, MEP, EMG, ICP, NIRS, SjvO2, PbtO2) to adjust anesthetic management (drugs, BP, etc.) with indirect supervision.Recognizes malfunctions of advanced monitoring equipment. | Inserts arterial catheters and central venous catheters independently and with due attention to the selection of appropriate site and side.Independently selects specific monitoring modalities for neurosurgery based on clinical indication (EEG, SSEP, MEP, EMG, ICP, NIRS, SjvO2, PbtO2, TCD, TEE, precordial doppler).Recognizes and appropriately troubleshoots with conditional independence, malfunctions of advanced monitoring equipment. | Performs jugular venous oximetry, TCD ultrasonography, precordial Doppler, ONSD measurement, basic EEG and evoked potential monitoring.Independently selects and uses basic and advanced neuromonitoring techniques for neurosurgery as well as non-neurological procedures in patients with neurological disease. Supervises other members of the health care team in the placement, interpretation and troubleshooting of monitoring techniques. |
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