High-risk surgery

- Early life adversity increases risk for chronic post-traumatic pain, data from humans and rodents
- Prospective insights into pediatric neurosurgery: transforming care through adverse event analysis
- Delayed Deep Femoral Artery Injury Secondary to Migrated Lesser Trochanter Fragment After Intertrochanteric Fracture Fixation: A Case Report and Updated Literature Review
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- Risk factors and prognosis of post-surgical acute kidney injury in elderly patients based on the MIMIC-IV database
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- ISASS Recommendations and Coverage Criteria for Bone-Anchored Annular Defect Closure Following Lumbar Discectomy: Coverage Indications, Limitations, and/or Medical Necessity-An ISASS 2025 Policy Update on the Use of Bone-Anchored Annular Closure to Prevent Reherniation in High-Risk Lumbar Discectomy Patients

High-risk operations have been defined as those with a mortality of >5%. This can be derived either from a procedure with an overall mortality of >5% or a patient with an individual mortality risk of >5%. Simple clinical criteria can be used to identify high surgical risk patients.

Risk Factors

High-risk surgery refers to procedures that carry a higher likelihood of complications or poor outcomes compared to standard surgeries. This can be due to a variety of factors, such as the complexity of the operation, the patient's overall health condition, or the presence of underlying conditions (e.g., heart disease, diabetes, advanced age, or compromised immune function).

Factors that contribute to a surgery being classified as high-risk include:

Patient-related factors: Age, pre-existing medical conditions (e.g., hypertension, diabetes), frailty, obesity, or malnutrition. Procedure-related factors: Complex procedures, surgeries involving major organs (heart, brain, liver), prolonged duration, or surgeries requiring significant blood loss. Surgeon and facility factors: The experience of the surgical team, availability of specialized equipment, and overall facility capabilities can influence risk. Common high-risk surgeries include:

Cardiac surgery (e.g., coronary artery bypass grafting, valve replacements) Major vascular surgeries (e.g., aortic aneurysm repair) Transplant surgeries Neurosurgery Complex cancer surgeries Patients undergoing high-risk surgery often require more intensive preoperative planning, intraoperative monitoring, and postoperative care, including close observation in an intensive care unit (ICU).

Communication about patients' goals and planned and potential treatment is central to advance care planning. Undertaking or confirming advance care plans is also essential to preoperative preparation, particularly among patients who are frail or will undergo high-risk surgery.

Despite increasing Life-Sustaining Treatment (LST) note implementation, a minority of veterans completed an LST note preoperatively. Although doing so was more common among veterans with an elevated risk compared with those at lower risk, improving proactive communication and documentation of goals, particularly among higher-risk veterans, is needed. Doing so may promote goal-concordant surgical care and outcomes¹⁾.

Scales

Several scales and tools are used to assess the risk of complications or mortality in patients undergoing high-risk surgeries. These scales help healthcare providers predict outcomes and tailor perioperative care to reduce risks. Below are some commonly used high-risk surgery scales:

1. American Society of Anesthesiologists (ASA) Physical Status Classification

Description: The ASA scale assesses the preoperative health of a patient. It ranges from I (healthy) to VI (brain-dead patient undergoing organ donation). Categories: ASA I: Healthy patient, no medical problems. ASA II: Mild systemic disease (e.g., controlled hypertension). ASA III: Severe systemic disease (e.g., poorly controlled diabetes). ASA IV: Severe systemic disease that is a constant threat to life (e.g., recent heart attack). ASA V: Moribund patient, unlikely to survive without surgery. ASA VI: Brain-dead patient, organs being removed for donation. Use: Helps predict the likelihood of perioperative complications and mortality.

2. Revised Cardiac Risk Index (RCRI) Description: Assesses the risk of cardiac complications after noncardiac surgery by considering six factors. Risk Factors: History of ischemic heart disease History of heart failure History of cerebrovascular disease (e.g., stroke) Diabetes requiring insulin Chronic kidney disease (creatinine >2 mg/dL) High-risk surgery (e.g., major vascular surgery) Use: A score of 0 to 6 predicts the likelihood of major cardiac events like myocardial infarction or heart failure after surgery.

3. National Surgical Quality Improvement Program (NSQIP) Risk Calculator Description: Developed by the American College of Surgeons, NSQIP uses patient-specific data (e.g., age, functional status, comorbidities) and type of surgery to estimate the risk of 30-day mortality and other complications. Use: Provides individualized risk predictions for outcomes like mortality, pneumonia, surgical site infections, and prolonged ventilation.

4. Charlson Comorbidity Index (CCI) Description: Assesses the burden of chronic diseases to predict 1year mortality risk in patients undergoing surgery. Conditions: Includes comorbidities like heart disease, cancer, liver disease, and diabetes, each of which is assigned a score. Use: Higher scores indicate a greater risk of postoperative complications and mortality.

5. POSSUM and P-POSSUM (Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity) Description: These tools assess surgical risk by considering both physiological factors (e.g., age, blood pressure, heart rate) and surgical factors (e.g., type and severity of surgery). Use: P-POSSUM (a modification of POSSUM) is more accurate for predicting mortality in high-risk surgeries and helps guide preoperative and postoperative care.

6. EuroSCORE (European System for Cardiac Operative Risk Evaluation) Description: A tool used specifically to estimate the risk of death after cardiac surgery. Factors: Includes patient-related factors (e.g., age, renal function, comorbidities) and procedure-related factors (e.g., type of heart surgery). Use: Widely used in Europe for risk stratification in cardiac surgery.

7. APACHE II (Acute Physiology and Chronic Health Evaluation) Description: A scoring system commonly used in intensive care units (ICUs) to assess the severity of disease and predict mortality in critically ill patients. Factors: Considers acute physiological variables (e.g., body temperature, blood pressure, oxygenation), age, and chronic health status. Use: Helps predict surgical outcomes for high-risk patients in the ICU.

8. E-PASS (Estimation of Physiologic Ability and Surgical Stress) Description: A tool that evaluates the physiological reserve of patients and the stress imposed by surgery. Components: Preoperative risk score (patient's age, functional status) Surgical stress score (based on blood loss, operative time) Use: Predicts postoperative morbidity and mortality based on the patient's ability to withstand surgical stress. Each of these scales provides valuable insights into a patient's risk profile, allowing clinicians to optimize surgical planning and postoperative care. Depending on the type of surgery, the patient's condition, and the healthcare facility's resources, different scales may be used to assess risk.

Complications

High-risk surgeries carry a heightened likelihood of complications due to the complexity of the procedure or the patient's health status. These complications can arise during or after the surgery and can affect various systems of the body. Here are some common complications associated with high-risk surgeries:

1. Cardiovascular Complications Heart attack (myocardial infarction): Stress on the heart during surgery can lead to insufficient blood flow and oxygen to the heart muscle. Arrhythmias: Irregular heartbeats or electrical disturbances may occur, especially in cardiac surgeries. Stroke: Blood clots or emboli dislodged during surgery can travel to the brain, causing a stroke. Deep vein thrombosis (DVT): Blood clots may form in the legs or pelvis, potentially leading to a pulmonary embolism if they travel to the lungs. 2. Respiratory Complications Pneumonia: Postoperative lung infections are common, especially in older patients or those with pre-existing respiratory conditions. Pulmonary

embolism: A blood clot that lodges in the lungs, blocking blood flow and impairing oxygenation. Respiratory failure: The inability to breathe adequately, which may require mechanical ventilation. 3. Infections Surgical site infections (SSI): Infection of the incision site or deeper tissues, potentially requiring antibiotics or further surgery. Sepsis: A severe, body-wide infection that can occur when bacteria enter the bloodstream from the surgical site or other parts of the body.

Bleeding and Hemorrhage

Intraoperative bleeding: Excessive blood loss during the procedure may necessitate blood transfusions. Postoperative bleeding: Continued bleeding after surgery may require additional interventions to control it.

Tranexamic acid (TXA), an antifibrinolytic agent, reduces surgical bleeding in a variety of procedures, such as cardiac, orthopedic, abdominal, and urologic surgery, cesarean section, and neurosurgery. However, there are surgical interventions for which its use is not yet widespread, and some caution persists because of concerns regarding thrombotic risk. The purpose of this review is to analyze the most recent evidence in various subgroups of surgical specialties and the association of TXA with thrombotic events and other side effects (e.g. seizures).

Recent findings: Recent clinical trials and meta-analyses have shown that the efficacy and safety vary according to the clinical context, timing of administration, and dose. Some reports found that TXA reduces major bleeding by 25% without a significant increase in thrombotic events.

Summary: Wider use of TXA has the potential to improve surgical safety, avoid unnecessary blood use, and save healthcare funds²⁾.

Wound Healing Issues

Delayed wound healing: Poor blood supply or other factors may slow the healing process. Wound dehiscence: Separation of the surgical incision, which may require additional surgery. 6. Renal (Kidney) Complications Acute kidney injury (AKI): Reduced blood flow or other stresses during surgery may impair kidney function, leading to kidney failure in severe cases. 7. Gastrointestinal Complications Ileus: A temporary stoppage of intestinal function after surgery, leading to abdominal pain, bloating, and difficulty passing gas or stool. Gastrointestinal bleeding: Damage to the stomach or intestines may result in internal bleeding. 8. Neurological Complications Cognitive dysfunction: Patients, especially the elderly, may experience confusion, memory loss, or delirium after surgery. Peripheral nerve injury: Nerves can be damaged during surgery, leading to temporary or permanent numbness, weakness, or pain. 9. Multiorgan Failure In some cases, severe complications such as infection, hemorrhage, or respiratory failure can lead to failure of multiple organs, a life-threatening situation. 10. Death The most serious risk in high-risk surgeries is the possibility of death, which may result from any of the complications mentioned above. Given the increased risks, careful preoperative assessment, optimization of the patient's medical condition, and meticulous postoperative care are critical in high-risk surgeries to minimize these complications.

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