Management of common surgical complications

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Abstract

Postoperative complications represent a potentially avoidable cause of morbidity and mortality. The incidence rate of major complications following inpatient surgical procedures has been reported as up to 22% with a mortality of up to 0.8%. It is estimated that 187–281 million surgical procedures are performed globally each year, suggesting that annually, at least 7 million patients will suffer serious complications as a consequence of surgery and that 1 million patients may die as a result. Meticulous preoperative assessment and planning is essential and allows for the delivery of preventative measures throughout the perioperative period. The importance of recognizing complications early, when they do arise, is essential and allows for the timely provision of appropriate and targeted therapies. This article describes common surgical complications and suggests management strategies that can be instituted throughout the surgical care pathway in order to reduce complication rates and decrease unnecessary morbidity and mortality.

Keywords Haemorrhage; pain; patient safety; surgical complications; surgical site infection; venous thromboembolism

Classification of postoperative complications

All operations carry risk and complications may be classified as being ***General***, as a consequence of undergoing any surgical procedure or as ***Specific*** to the particular operation being performed.

Complications may be further divided by time of onset: ***Immediate*** (within the first 24 hours of surgery), ***Early*** (within 30-days or during the inpatient episode or ***Late*** (after 30 days).

Table 1 summarizes the chronological onset of some common ***General*** postoperative complications.

Managing the risk of complications

The mainstay of management of any surgical complication remains:

- risk assessment and prevention
- early recognition
- immediate and appropriate management.

Risk assessment and prevention

Preoperative assessment of co-morbidity and pre-morbid function allows the clinician to predict likely risks for a specific patient undergoing any given surgical procedure. The surgical team may then institute risk-reducing measures to minimize complications. This phase includes the opportunity to optimize co-morbid conditions and their management (such as treating hypertension or COPD) along with the instigation of specific prophylactic measures (such as the use of antibiotics or the choice of anaesthetic technique).

A further measure of reducing operative complications is the implementation of the World Health Organization (WHO) Surgical Safety checklist. This has been shown to reduce surgical morbidity by 30% and mortality by almost 50%, by identifying and eliminating avoidable error.[1]

Early recognition

Early detection and timely intervention is key to reducing the morbidity of postoperative complications and this relies on the vigilance of clinicians, with attention to detail. The majority of hospital trusts advocate *early warning scores (EWS)* to identify and respond to patients who present with or develop acute illness. Scores reaching certain thresholds will trigger a call for urgent clinician review.

Immediate and appropriate management

Following early recognition, it is essential for appropriate management strategies to be implemented in order to reduce significant morbidity or even mortality. This may involve medical or surgical therapies and may culminate in referral to other specialties or escalation to a higher level of care. The following sections give a summary of common surgical complications and outlines of preventative and management options.

Common surgical complications

Haemorrhage

Perioperative bleeding that results in cardiovascular instability is associated with poor outcomes and has a high incidence of significant morbidity or mortality.[2] Hypovolaemia is largely avoidable and therefore prophylactic and early resuscitative measures should be instituted in order to mitigate or avoid physiological upset.

- Types of haemorrhage:
  - **Primary haemorrhage:** Intraoperative bleeding or a continuation of intraoperative bleeding noticed after surgery. Usually occurs as a result of inadequate haemostasis.
  - **Reactionary haemorrhage:** Bleeding occurring immediately postoperatively (within 24 hours, typically 4–6 hours) as a consequence of patient warming/vasodilation and increasing blood pressure during recovery from anaesthesia.
  - **Secondary haemorrhage:** Typically 7–14 days following surgery and usually as a consequence of local infection.

Prevention

Preoperatively, the patient's risk of bleeding should be carefully assessed, which includes a review of medications such as antiplatelet agents and anticoagulants and their indications. Depending on the specific risks of the planned operation, it is often safe to stop these drugs during the perioperative period,

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Chronological relationship of common surgical complications

Day	1	2	3	4	5	6	7	8	9	10
Respiratory	Basal atelectasis		Chest infection/pulmonary embolism							
Cardiovascular	Haemorrhage/hypovolaemia/electrolyte disturbance/atrial fibrillation/myocardial infarction									
Renal	Urinary retention									
		Acute kidney injury								
Gastrointestinal	Nausea and vomiting/ileus/abdominal compartment syndrome									
					Anastamotic leak/fistula					
Pain	Wound pain									
Infection			Wound infection							
					Deep infection					

Table 1

however it is usually best to obtain specialist advice from haematology or cardiology where required.

Some patients may present for surgery with a pre-existing anaemia due either to a co-morbidity, dietary insufficiency or, indeed, the acute pathology necessitating the operation. Any significant anaemia is best corrected before the planned surgery and preoperative transfusion should occur at least 48–72 hours before an elective procedure, in order to maximize the oxygen carrying capacity of the transfused blood.

Depending on the specific risks of the planned procedure, blood should be drawn for group and save or cross-match and this should be completed with sufficient time to address any potential difficulties that may be created by the detection of unusual antibodies. The planning phase should also include arrangements for the use of cell-salvage where available if a significant blood loss is anticipated. Preoperative dehydration should be avoided by appropriate ordering of the operating list and the use of maintenance IV fluids where required.

Intraoperatively, meticulous surgical technique is essential to avoid unnecessary blood loss and difficulties, when encountered, should be communicated to the theatre and anaesthetic team.

Diagnosis

Primary haemorrhage should be identified at the time of operation and controlled appropriately. Reactionary or secondary haemorrhage may be identified postoperatively in the form of an external bleed (active bleeding, blood in drains) or internal bleed (patient is hypotensive, tachycardic, pallored, confused and oliguric with a low serum haemoglobin).

Management

The control of major haemorrhage is covered elsewhere in this issue, but mandates adequate venous access, with concomitant control of the bleeding source and the administration of appropriate blood products and/or volume replacement.

Surgical site infections

Surgical site infections (SSIs) are defined as infections that occur at the site of an operation within 30 days if no implant or foreign body is left within the patient during surgery, or within 1 year of an operation if an implant or foreign body is left in situ.[1] SSIs account for 15% of hospital-related infections and are associated with significant morbidity and mortality.[3] In the UK alone each SSI accumulates excess costs of £1594 and can increase hospital length of stay by up to 7 days.[2,4] Patients with SSIs are also twice as likely to die following a surgical procedure and, if discharged, have a fivefold increased chance of being readmitted.[2]

The incidence of wound infections is related to the type of operation being performed with *Clean* operations (e.g. excision of skin lesion) having an infection rate of less than 1%, *Contaminated* procedures (e.g. appendicectomy) 15–20% and *Infected* procedures (e.g. Hartmann's procedure for diverticular perforation) approximately 40%.[5] Two-thirds of SSIs are related to the wound and the remaining third are confined to the organ space.[6] Organisms causing such infections usually originate from the patients normal skin or bowel flora. Less commonly, bacterial contamination may occur from an exogenous source, such as from contamination by theatre staff, airborne pathogens, non-sterile instruments or prostheses.[1]

Prevention

Numerous modifiable risk factors exist for developing an SSI:

- Preoperative:
  - Patient factors:
    - Weight loss
    - Stop smoking
    - Control hyperglycaemia
    - Treat existing bacterial colonization (MRSA screening)
    - Optimize nutrition
- Perioperative:
  - Surgical factors:
    - Hair removal (clipping not shaving)
    - Aseptic technique
    - Meticulous surgical technique
    - Minimize operating time
    - Avoid hypothermia by using patient-warming devices
    - Antibiotic prophylaxis where appropriate