REVIEW ARTICLE

PERI OPERATIVE MANAGEMENT OF THE HIGH RISK SURGICAL PATIENT

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ABSTRACT: Around 15% of people who undergo inpatient surgery are at high risk of complications, such as pneumonia or myocardial infarction, Because of age, comorbid disease, or the complexity of the surgical procedure. Identification of high risk patients pre-operatively based on patient and/or surgical criteria or by formal dynamic testing of functional capacity is desirable and possible. An increase in the availability of less invasive monitoring equipment, including oesophageal Doppler and arterial waveform analysis, has facilitated the widespread use of cardiac output monitoring. Starting goal directed therapy at any time during the peri-operative period has shown benefit. More effective systems can improve quality of perioperative care and may improve survival while reducing healthcare costs.
KEYWORDS: high risk, goal directed therapy, peri operative management.

INTRODUCTION: The perioperative care of patients undergoing major surgery is increasingly recognized as an area that substantially affects public health and for which needs are poorly met. Around 15% of people who undergo inpatient surgery are at high risk of complications, such as pneumonia or myocardial infarction, because of age, comorbid disease, or the complexity of the surgical procedure.[1]

Chronic conditions that often affect postoperative outcomes include diabetes, hypertension, heart failure, chronic obstructive pulmonary disease, and poor nutritional status.[2] More effective systems can improve quality of perioperative care and may improve survival while reducing healthcare costs.

The use of routine postoperative admission to critical care may result in more effective resource use than the current approach, in which patients go to a surgical ward immediately after major surgery with subsequent escalation to critical care only when complications develop. Further research is needed to identify the most effective approaches to perioperative medicine for high risk patients. Routine audit of outcomes after all non-cardiac surgery is urgently needed.

Patient
Ability to return to work
Possibility of disability
Success of operation
Family
Will patient be able to resume role as carer?
Will patient survive?
Nurse
Infection transmission
Violence towards self
Surgeon
Likelihood of operative success
Possibility of operative misadventure
Anaesthetist
Likelihood of surviving 30 days
Likelihood of surviving the anaesthetic
Intensivist
Likelihood of leaving the intensive care unit
Prolonged stay on the intensive care unit
Administrator
Outcome poorer than comparative unit
Care costing more than allocated

Table 1: Important milestones in the perception of high risk[3]

Current or previous severe, cardio-respiratory illness (myocardial infarction stroke, heart failure, chronic obstructive pulmonary disease (COPD), severe asthma)
Acute abdominal catastrophe with haemodynamic instability (pancreatitis, perforated bowel with peritoneal soiling, severe gastrointestinal bleeding)
Acute renal failure (acute onset renal dysfunction with urea >18 mmol or creatinine >265 mmol litre_1)
Severe multiple trauma (more than three major organs involved or more than two systems or surgical opening of more than two body cavities)
Evidence of limited physiological reserve in one or more vital organs in elderly patients more than 70 yr
Shock (MAP <60 mm Hg, urine output <0.5 ml kg_1 h_1)

Acute respiratory failure (PaO2 <8 kPa, FIO2>0.4, shunt fraction >30%, mechanical ventilation required for >48 h)
Septic shock

Table 2: Shoe maker and colleagues criteria for identifying patients at high risk of perioperative complications[4]

Colorectal, vascular, a intra-abdominal surgery
Trauma surgery involving more than two body cavities or intraperitoneal soiling with bowel contents
Prolonged surgery (>11/2 h)
Emergency surgery

Table 3: Surgical considerations for identifying the high-risk patient. Studies by Mangano and colleagues[5] and Polderman and colleagues[6] amongst others have identified a group of patients who may do better from perioperative beta blockade, the primary risk being from cardiac ischaemia

Class	Mortality (%)	Description
I	Healthy 0.1	0.1
II	Mild systemic disease — no functional limitation	0.7
III	Severe systemic disease — definite functional limitation	3.5
IV	Severe systemic disease — constant threat to life	18.3
V	Moribund patient unlikely to survive 24 hours with or without operation	93.3
E	Emergency operation	

Table 4: American Society of Anaesthesiologists' status classification: modified from Wolters and colleagues[7]

Pre-operative risk assessment by non-invasive cardiac stress testing, such as cardio-pulmonary exercise testing (CPET) or dobutamine stress echocardiography. There is particular interest in the use of CPET, which involves exercise on a cycle ergometer with simultaneous spirometry to provide indices of cardiorespiratory function. Poor exercise capacity determined by CPET is associated with increased rates of postoperative complications and death.[8] An emerging technology is the use of preoperative blood sampling to measure biomarkers in plasma. Promising candidate markers include B-type natriuretic peptide, glomerular filtration rate estimated from serum creatinine, and cardiac troponins.

RISK SCORING SYSTEM[9]

ASA is simple but subject to user interpretation.

RCRI used to predict cardiac risk for non-cardiac surgery.

POSSUM can only be used postoperatively and is better for some surgeries like colorectal and vascular.

CEPT is non-invasive and objective method.

Optimization of perioperative intravenous fluid and inotropic therapy: An increase in the availability of less invasive monitoring equipment, including oesophageal Doppler and arterial waveform analysis,[10] has facilitated the widespread use of cardiac output monitoring. The National Institute for Health and Clinical Excellence (NICE) has endorsed the use of perioperative cardiac output monitoring (oesophageal Doppler) while acknowledging the need for furtherresearch.[11]

The use of fluid and dobutamine conferred better post-operative outcomes with less cardiovascular complications than the fluid alone group in a study done by Lobo and co-workers.[12] Those patients given dobutamine were more likely to achieve the goals. Dobutamine is also a positive inotrope and peripheral vasodilator. Dopexamine is a dopamine analogue with actions at beta adrenoreceptors and also at peripheral dopamine receptors.

It is a positive inotrope and peripheral vasodilator that improves microcirculatory flow and splanchnic perfusion and oxygenation, which may reduce inflammation secondary to the tissue hypoxia and translocation of bacterial products or endotoxin.[13] Optimizing medical management of coexisting diseases and intraoperative considerations is of utmost importance in all the procedures but additional care should be taken regarding cardiovascular and respiratory systems.[9]

1. MINIMISING MYOCARDIAL ISCHEMIA
   a) Anaesthesia should avoid tachycardia, hypertension and hypotension
   b) Pain control is important
   c) Oxygen supplementation is advisable for 3-4 days postoperatively
   d) Perioperative Beta blockade
   e) Elective postoperative critical care

2. CARDIAC FAILURE
   a) Ejection fraction <35%
   b) Beta blockade and ACE inhibitors
   c) Anaesthesia should ensure minimal myocardial depression and change is afterload during surgery.
   d) AF and correcting electrolyte imbalance is crucial
   e) Invasive monitoring of trends in central venous and arterial pressure monitoring

3. RESPIRATORY FAILURE
   a) Preoperative pulmonary function test
   b) Bronchodilator and steroid therapy

c) Pre and post-operative chest physiotherapy and breathing exercises
d) Consider regional anaesthesia
e) Give good quality of pain relief
f) Use non-invasive ventilation strategies.

SPECIFIC STRATEGIES: Prophylactic beta blockade POISE, a large randomized trial, used beta blockers in the 'at risk' group undergoing non-cardiac surgery. It had the Advantage of decreased mortality and Myocardial infarction. The following were the disadvantages:

- increased risk of hypotension, strokes and deaths overall.
- Patients already taking beta blockers must continue their medication.
- if freshly indicated, titrate to heart rate & BP over at least a week before surgery.

Follow European guidelines (pre-op benefits of beta blockade)

GOAL DIRECTED THERAPY: High-risk patients have a poor outcome due to their inability to meet the oxygen transport demands imposed on them by the nature of the surgical response during the peri-operative period. It has been shown that by targeting specific haemodynamic and oxygen transport goals at any point during the peri-operative period, the outcomes of these patients can be improved.

This goal directed therapy includes the use of fluid loading and inotropes, in order to optimize the preload, contractility and afterload of the heart whilst maintaining an adequate coronary perfusion pressure. This therapy came into existence because of persistent inadequate tissue perfusion peri operatively which led multi organ failure. And high risk patients who survived had higher cardiac indices and oxygen delivery.

AIM:

1. Use of less invasive modalities of cardiac output measurement like Doppler, lithium dilution and dd pulse contour analysis equipment which have largely superseded the PAC.
2. Fluids guided by GDT can reduce complications from surgery (cardiac, orthopaedic and abdominal surgery.
3. Inotropes and careful vasopressors (which increase myocardial oxygen demand) are still required in many high risk patients.
4. Titrated doses of beta blockers can benefit in a prevailing risk of ischemia.[9]

There is emerging evidence that GDT have benefits if commenced intraoperatively and even postoperatively.

MINIMISING THE IMPACT OF SURGICAL RISK FACTORS:

1. Laparoscopic surgery is preferred technique for patients predisposed to post-operative respiratory complications, but not helpful for cardiac complications.
2. Minimal access surgery like Robotic prostatectomy and laparoscopic colorectal procedures can be associated with less complications of myocardial infarction.
3. Risk minimised by careful patient selection.

CONCLUSION: Identification of high risk patients pre-operatively based on patient and/or surgical criteria or by formal dynamic testing of functional capacity is desirable and possible. Maintaining an adequate oxygen flux in tissues is crucial for health and ensuring tissue perfusion is the key to GDT. Starting GDT at any time during the peri-operative period has shown.

Perioperative management of high risk patients is multidisciplinary team approach for its success. The Novel treatment strategies offer the prospect of significant improvement in outcome. Increased awareness of the critical care physician is the cornerstone of the management. The ICORS (INTENSIVE CARE OUTREACH SERVICES) should function to bridge the gap between critical care unit and ward.

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