



# Perioperative Medicine

FOR THE JUNIOR CLINICIAN



Joel Symons, Paul Myles  
Rishi Mehra and Christine Ball

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## Preface

The era of painless surgery began in the 1840s with the introduction of general anaesthesia, frequently described as the greatest medical discovery of all time. General anaesthesia provided greatly improved operating conditions for the surgeon and an ideal environment for the anaesthetist to appreciate the clinical applications of cardiorespiratory physiology and early drug pharmacology. These developments led to an urgent need for new equipment and improved antisepsis. All of these challenges were overcome by pioneers in anaesthesia, surgery, nursing and public health. Surgery offered cure or relief of symptoms for a rapidly growing number of conditions.

In the mid-20th century, recovery rooms and, later, intensive care units became established in most hospitals. But by the 1980s it was apparent that inadequate preoperative assessment and deficiencies in postoperative care were recurring features in reports from national anaesthetic and surgical mortality committees in many countries. The importance of optimising medical conditions before surgery, patient monitoring, pain management and the postoperative inflammatory process became better understood and appreciated. As outcomes continued to improve and more and more people were having surgery, more extensive surgery was being offered to older patients, often with concurrent medical diseases and drug treatments. The boundaries were constantly being tested, pushing the limits of who was or wasn't an operative candidate. An increasing need for higher acuity postoperative care developed which could not be met, despite innovations such as extended recovery and high-dependency units. As a result, postoperative patients at

high risk of complications can now be found on the surgical wards of any hospital.

Excellence in perioperative care includes the seamless transition of an informed, medically optimised patient before surgery, through the operation, to a recovery period free of complications and with minimal discomfort, to optimal health. This cannot happen in a traditional model of medical specialty 'silos', with gaps in knowledge and care. It requires trained, multidisciplinary, team-based care, and should be embedded in a clinical care pathway focused on enhancing patient recovery.

We designed this book to provide up-to-date knowledge and advice from a broad range of medical specialists caring for surgical patients. It is intended to be succinct and practical, providing overviews to guide perioperative care. For e-book readers there is extra material with audio and video links. For junior doctors grappling with the complexity of perioperative care, the book can be read as a whole. For those needing information or advice on a specific problem, the book can be used as a ready reference.

This book is organised into nine sections. The first introductory section outlines some of the principles and practices of perioperative care. The following sections address preoperative risk assessment, laboratory investigations, medication management, specific medical conditions and complications concerning surgical patients, postoperative care and pain management. The book ends with some case scenarios, and finally a series of quizzes to test junior clinicians' knowledge of pertinent laboratory investigations.

To contribute to the care of patients undergoing anaesthesia and surgery is a great honour. We must never

forget how much our patients depend on our knowledge,  
skills and vigilance.

**Paul Myles, MBBS, MPH, MD, FCARCSI, FANZCA,  
FRCA, FAHMS**

Melbourne, Australia

[www.periopmedicine.org.au](http://www.periopmedicine.org.au)

[www.masters.periopmedicine.org.au](http://www.masters.periopmedicine.org.au)

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Joel Symons  
Paul Myles  
Rishi Mehra  
Christine Ball  
Melbourne, Australia

## About the companion website

This book is accompanied by a companion website:



[www.wiley.com/go/perioperativemed](http://www.wiley.com/go/perioperativemed)

The website includes:

- Videos
- Case studies
- Quizzes
- Appendix A: Unit conversions
- Appendix B: Basic airway management including bag-mask ventilation
- Appendix C: Opioid conversion table
- More information about the contributors
- Abbreviations used in the book
- Links to websites to further supplement information contained in this book

**Part I**  
**Introduction**

# 1

## The role of the perioperative medicine physician

Mike Grocott

University of Southampton, United Kingdom

The care of patients undergoing major surgery has evolved incrementally since anaesthesia revolutionised surgical care in the years following 1846. Whilst pharmacological and monitoring technologies have advanced, anaesthetists have remained predominantly focused on the operating room environment and have in general resisted moves outside this 'comfort zone'. Surgeons have been the principal care deliverers around the time of surgery. In the last two decades, this has begun to change, with a shift towards an expanded role in perioperative care for the anaesthetist. In parallel, physicians have become more interested in improving the perioperative care of some groups of patients. For example, the engagement of geriatricians in the care of patients undergoing hip fracture surgery has led to the concept of the 'ortho-geriatrician'. Meanwhile, manpower issues in surgical specialties have created pressure for many surgeons to concentrate on operating time, over and above other elements of the care of surgical patients. As a consequence, new labels have developed including perioperative medicine (1994), the perioperative physician (1996) and most recently the perioperative surgical home (2011).

So what has driven the increased focus on perioperative care? Primarily, there has been recognition of unmet need. With growth in the volume and scope of major surgery has come an epidemic of postoperative harm. This is an



inevitable consequence of more adventurous, technically challenging surgery in an ageing population with multiple co-morbidities [1]. The global volume of major surgery is approaching 250 million cases per year. Short-term (hospital/30-day) mortality following major surgery, even in the developed world, may approach 4% and morbidity is more frequent by an order of magnitude [2,3].

Furthermore, the substantial impact of short-term postoperative morbidity on subsequent long-term survival is increasingly recognised as an important healthcare challenge [3]. Taken with the growing literature describing interventions that affect postoperative outcome [4], this suggests a significant burden of avoidable harm.

## **The scope of perioperative medicine**

This spans the period from the moment that surgery is first contemplated through to complete recovery. The role of the perioperative physician includes preoperative risk evaluation, collaborative (shared) decision making [5], optimisation of all aspects of physiological function prior to surgery, individualised 'goal-directed' best intraoperative care, delivering the appropriate level of postoperative care and rehabilitation to normal function [4]. The preoperative period offers a unique opportunity to invest in improving physiological function in a short defined period of time, for example through physical prehabilitation, in patients who are likely to be highly motivated in the face of an imminent threat. Furthermore, the patient-perioperative physician interaction may be one of very few contacts that an individual patient has with medical professionals and offers an opportunity for general health messaging as well as implementation of primary and secondary prevention strategies.

In the post 'evidence-based medicine' era, the focus of medical practice will increasingly move towards personalised/stratified/precision medicine [6]. The technology available to quantify and classify perioperative risk is becoming increasingly sophisticated. In the future, this process is likely to involve a combination of clinical risk scores, objective evaluation of physiological reserve (e.g. cardiopulmonary exercise testing) and the use of specific plasma biomarkers, interpreted in the context of the patient's genotype (+/- epigenetic processes). Perioperative decision making will involve expertise in interpreting such data coupled with understanding of the planned operative procedure and a high degree of competence in collaborative decision making [5]. Improving the quality of decision making through the use of decision aids has been shown to reduce patient choices for discretionary surgery [7] and is likely to have a similar effect across all types of surgery. In the context of an extraordinarily high incidence of surgery during the final months of life [8], such an approach is likely to be beneficial for the quality of life of patients and their carers, as well as for an overburdened healthcare system.

The scope of decision making will include consideration of the extent of surgery, use of adjunctive therapies, and modification of pre-, intra- and postoperative care. Patients with limited physiological reserve may be prescribed general (prehabilitation) or specific (e.g. inspiratory muscle training) preoperative interventions. Intraoperative care may be focused on monitoring and interventions to address particular risks such as cardiac, pulmonary or cognitive dysfunction. The location and intensity of postoperative care will be based on the risk of harm assessed prior to surgery, modified by the response to the physiological challenge of surgery.

Postoperative intensive care has always been made available to patients requiring specific organ support. Increasingly, patients at elevated risk are being offered an enhanced level of postoperative care and monitoring to ensure early rapid and effective response to developing complications and avoid 'failure to rescue'.

## Clinical data

The effective use of clinical data will be critical in the development of high-quality perioperative care and making best use of such data will be an important part of the perioperative physician's role [9]. National audit data have highlighted stark differences in quality of care and outcome for specific patient groups, most notably those undergoing emergency procedures such as hip fracture and emergency laparotomy surgery [10]. Systematic audit and quality improvement will serve to 'level the playing field' for patients undergoing diverse types of surgery. The data collected will also contribute to the development of increasingly sophisticated clinical risk tools that will, in turn, facilitate the delivery of precision medicine for this patient group.

## The future

It is likely that in many contexts, anaesthetists will take the lead as perioperative physicians, due to their unique combination of competencies and experience. However, the role of the perioperative physician should be competency based and collaborative, and physicians and surgeons will also be involved in leading perioperative care. Irrespective of issues around professional identity, the primary aim of all perioperative physicians should be to improve the quantity and quality of life for patients undergoing major surgery.

This will be best achieved by working closely with patients, surgeons and the extended perioperative care team to choose and deliver perioperative care of the highest quality through the interpretation of clinical evidence in the context of an individual patient's life and wishes [11].

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## 2

# The role of the preadmission clinic

James Tomlinson  
The Alfred Hospital, Australia

Patient evaluation before anaesthesia for surgical and non-surgical procedures is essential. It is the responsibility of the anaesthetist to ensure it is completed adequately. Traditionally, patients were admitted to hospital several days before surgery for assessment, placing significant demands on hospital resources. Many hospitals now operate an outpatient preadmission clinic (PAC) for elective admissions where patients can be assessed in a timely fashion prior to their hospital procedure. The PAC fulfils multiple important roles ([Video 2.1](#)).



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**VIDEO 2.1** Roles of the preadmission clinic. The modern preadmission clinic fulfils a vital role in the perioperative management of patients.

1. Patient assessment
2. Risk factor identification and management, and patient optimisation

3. Improved safety and quality of care
4. Improved hospital efficiency
5. Patient support, education and awareness
6. Record keeping and research
7. Staff development

## **Patient assessment**

Information is gathered from multiple sources including patient questionnaires, medical records, patient interview, physical examination and medical investigations.

### **Information collation**

Basic patient health and demographic information should be gathered prior to the PAC to inform risk stratification and appropriate patient triage. Triage helps avoid unnecessary assessment of low-risk patients and improves clinic efficiency [1]. This information can be gathered by institution-specific surveys electronically, via paper questionnaires or by telephone. Many institutions employ nursing staff to collect this information and make the initial risk assessment.

### **Assessment by the anaesthetist**

Patients triaged as moderate to high risk should attend the PAC for assessment by an anaesthetist. Assessment should include a patient interview and a physical examination of the airway, respiratory and cardiovascular systems. The aim of this assessment is to identify and quantify patient-specific risk factors.

It should be noted that in larger institutions, the anaesthetist assessing the patient in the PAC is commonly not the same anaesthetist providing care on the day of the

procedure. It is important that the procedural anaesthetist also assesses the patient independently prior to the commencement of the procedure.

## Investigations

Routine investigations (i.e. tests ordered without a clinical indication) should not be ordered preoperatively.

Disadvantages to routine testing include cost, time delays and patient discomfort. If routine tests are abnormal, there is then additional cost and time required to determine the clinical relevance of such results. Many studies demonstrate that routine testing does not improve patient care [2]. More importantly, there is evidence that abnormal test results may lead to further investigations that can potentially be harmful to patients [3].

Investigations should therefore only be ordered when clinically indicated. Standardised guidelines for preoperative investigations should be developed by each PAC. They should be specific for the institution, patient population and surgical procedure. These guidelines should be available online to ensure easy access by all clinic staff. Examples of such guidelines are freely available ([www.ncbi.nlm.nih.gov/books/NBK48489/](http://www.ncbi.nlm.nih.gov/books/NBK48489/)) [4].

## Multidisciplinary team assessment

The multidisciplinary preoperative team may include the anaesthetist, surgeons, preoperative nurses, pharmacists, physiotherapists, physicians and general practitioners. Depending on the results of the information gathered, the anaesthetist may choose to involve any or all of these healthcare professionals to further investigate, advise on and assist patient optimisation.



# Risk factor identification and management, and patient optimisation

Patient risk factors should be assessed and appropriate management plans implemented. Risk factors may be anaesthetic specific (e.g. difficult airway), or pertain to medical co-morbidities and surgical factors. Risk assessment can be useful in planning the patient's perioperative care.

Nine variables provide independent prognostic information.

- Age
- Sex
- Socioeconomic status
- Aerobic capacity
- Coronary artery disease
- Heart failure
- Ischaemic brain disease
- Renal failure
- Peripheral arterial disease

Preoperative patient optimisation should be guided by protocols developed for each institution [5]. They should cover issues such as:

- chronic disease management, e.g. diabetes, anaemia, cardiorespiratory illness

- anticoagulants
- venous thromboprophylaxis
- smoking cessation
- obesity and nutrition
- physiotherapy and inactivity.

A multidisciplinary team is useful to achieve this. Clear lines of communication should be established with the patient's GP so they can assist in preoptimisation.

## **Improve safety and quality of patient care**

Data from the Australian Incident Monitoring Study indicated that more than 10% of reported critical events were linked to inadequate preanaesthetic assessment [6]. These events were considered preventable in over 50% of cases. Many other studies have demonstrated that preoperative patient optimisation results in reduced morbidity and mortality, and a reduction in cancellations and delays [7].

## **Improve hospital efficiency**

Patient assessment allows the multidisciplinary team to establish a clear care plan for the patient.

- Preoperative care and admission requirements
- Hospital suitability depending on patient and surgical complexity
- Day surgery versus postoperative ward care
- High-dependency and intensive care unit support

- Discharge and rehabilitation planning

This aims to reduce cancellations and improve the efficient use of hospital resources, with lower patient bed occupancy and a reduction in length of stay. Many studies have demonstrated a significantly lower cancellation rate amongst patients receiving preassessment [8].

## **Patient support, education and awareness**

The PAC is an ideal opportunity to fully inform patients about all aspects of their care. The information should be specific for the patient and procedure, and ideally should be both verbal and written. Written instructions allow the patients to reference them when convenient. They can also be made available to patients online to improve accessibility. Verbal and written information should include:

- preoperative fasting guidelines
- anaesthetic options including advantages, disadvantages and risks
- options for pain relief
- instructions for patient medication, especially anticoagulants, diabetic and cardiac medication.

It is important not to miss this opportunity for discussion with the patient as improved patient education and awareness reduce fear and anxiety.

## **Record keeping and research**

Many institutions are now adopting electronic medical records. This allows for the standardisation of patient

information, avoids redundancy, can enhance quality improvement and can provide a database for research (1).

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# 3

## Consent

Justin Burke  
The Alfred Hospital, Australia

Medical consent is the voluntary agreement by a competent and informed patient to undergo a medical examination or treatment.

### Ethical and legal basis of consent

Doctors have an ethical and legal obligation to obtain patient consent prior to medical procedures. A doctor who touches a patient without explicit or implied consent is liable to a claim of *battery*. A doctor who fails to provide adequate information about the risks of a procedure is liable to a claim of *negligence*. Inadequate consent is a common source of patient complaints and disciplinary action by medical boards.

### Elements of a valid consent

#### Patient must have capacity

Adults are presumed to have legal capacity to consent. Capacity may be lost:

- permanently (e.g. dementia)
- temporarily (e.g. sedatives)

or:

- completely (no treatment decisions possible)

- partially (some decisions, not others).

To assess capacity, doctors should ask: does this patient understand the general nature and consequences of the treatment, and are they able to communicate a decision? If the patient has cognitive impairment *and* is unable to understand, retain or weigh up the information needed to make a decision at that time, then this is evidence of incapacity.

Minors generally require guardians to consent on their behalf. The Common Law does, however, recognise *competent minors* who are able to consent to medical procedures independently [1]. The doctor must be satisfied that the minor has the maturity and understanding to evaluate the treatment and consider the consequences of treatment or non-treatment. The more serious the intervention and consequences, the greater the maturity required.

## **Patient must be informed**

The patient must be informed of the nature and benefits of the proposed treatment, the inherent risks, the alternative treatment options and the likely outcome of no treatment at all. Use plain language and avoid medical jargon. Models, diagrams and written information can be useful aids to understanding. If necessary, use an interpreter service.

In Australia, doctors are legally obliged to disclose all *material risks* to the patient [2]. This means explaining risks that a reasonable person in the circumstances would consider significant, and also the risks that your particular patient may consider significant. This requires doctors to assess the patient's individual circumstances carefully, including temperament, desire for information and general

health. Doctors who explain risks using strict protocols may miss this important step.

When explaining the magnitude of a risk, be careful using phrases such as 'low risk' or 'very uncommon' because the patient's perception of these terms may differ from your own. If using numerical data, it is better to explain risks as proportions with a constant denominator (1 in 1000; 25 in 1000) rather than percentages. Using visual aids is one of the most effective means of improving the communication of risk [3].

At the end of any discussion about consent, the patient should be given the opportunity to consider the information and ask questions.

### **Consent must be voluntary**

Consent must be given freely without coercion or induced by fraud or deceit. Undue influence may be exerted by family members, community representatives or medical staff. Doctors should be careful not to coerce patients by withholding important information or overstating benefits.

### **Consent by junior doctors**

Guidelines recommend that the doctor consenting should be capable of performing the procedure himself or herself, or be specifically trained in advising patients about the procedure [4].

### **Documenting consent**

Health services have mandated standard consent forms for many medical treatments. These do not assure proper



consent process. Documenting the discussion, including the risks discussed and questions asked by the patient, provides a more useful record.

## **Special circumstances**

### **Patient lacks capacity**

In Australia, consent can be obtained from this patient's legal guardian or next of kin. If there are no next of kin, or they are unavailable, consent should be sought from a public guardian or court.

In the UK, only legally appointed Lasting Powers of Attorney or court-appointed deputies may consent for these patients, but the patient's family or carers should be consulted to help assess the patient's wishes, beliefs and values. After considering all the circumstances, the treating doctor is required to make a decision based on the best interests of the patient [5].

### **Emergency treatment**

Consent is not required for treatment believed necessary to save a patient's life or to prevent serious mental or physical injury. This is strictly interpreted and should not be used by doctors for convenience.

### **Patient refuses treatment**

Patients have the right to refuse medical treatment generally, or refuse specific procedures. Some jurisdictions have criminal penalties for performing a procedure on a patient who has refused (e.g. s. 6 Medical Treatment Act (Victoria) 1988) [6].

A competent patient has a right to refuse treatment for any reason, rational or irrational, even where the consequence

may be serious injury or death [7]. However, the courts are generally reluctant to allow minors to refuse life-saving treatments [8].

An incompetent patient who refuses treatment is a special case. In an emergency, it is reasonable to commence life-saving treatment; for non-emergency care, a court order may be required if treatment is thought to be in the patient's best interests.

### **Waiver and therapeutic privilege**

Occasionally a patient will waive their right to information about a medical treatment ('Please don't tell me, Doctor'). It is important they understand the general nature of the proposed treatment in order to consent but if they request no discussion of risk, then respect their wishes and document.

In rare circumstances, 'therapeutic privilege' can be exercised when a doctor *reasonably* believes disclosing information to a patient may *seriously harm* the patient's health or well-being.

## Summary

- Doctors have ethical and legal obligations to obtain patient consent.
- The patient must have legal capacity, be informed and give consent voluntarily.
- Explanation of risk requires an assessment of what the individual patient might consider significant.
- The most common exception to consent is emergency treatment.

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## 4

# The early postoperative round

Debra Devonshire<sup>1</sup> and Paul Myles<sup>2</sup>

<sup>1</sup> Monash Health, Australia

<sup>2</sup> The Alfred Hospital and Monash University, Australia

The first 24 hours after major surgery are often complex, with significant physiological, physical and emotional challenges. The physician conducting the early postoperative ward round is important in facilitating a smooth transition to recovery by maximising the patient's ability to overcome these challenges.

Postoperative review should not be limited to surgical problems (or the surgical wound), but includes surveillance for patient delirium, subclinical complications such as myocardial infarction and acute kidney injury, and assessment of deviation from care pathways (refer to [Chapter 90](#) Postoperative delirium and postoperative cognitive dysfunction, [Chapter 88](#) Myocardial injury after non-cardiac surgery and [Chapter 47](#) Acute kidney injury) [1].

## Establish rapport

The early round may often be the first time the physician and patient have met. It is important to quickly establish rapport. Mehrabian's studies in non-verbal communication during the late 1960s and early 1970s identified smiles, head nods, eye contact, orientation of body and head towards the person in conversation, and touch (such as a warm handshake) as factors which enhance verbal communication. This may sound obvious but many

physicians are often distracted from positive communication as they teach junior trainees, answer staff requests and balance time management so that the round proceeds efficiently. Examining and asking personal questions of patients requires tact and respect. Receiving honest, useful answers requires establishing a rapid empathic connection.

## Scan the record

It is essential to briefly become familiar with the patient's history prior to consultation. Specifically check the drug chart, surgical notes, anaesthesia chart and basic investigation results relevant to early management. For example, is the estimated glomerular filtration rate adequate or impaired? The answer may affect how analgesia is prescribed. Check how the patient responded in the recovery room. For example, were they slow to leave recovery due to hypotension or excessive drowsiness? Do they have tolerance or are they sensitive to opioids? Was there the common and distressing problem of postoperative nausea and vomiting (PONV)? Reviewing the surgical notes may reveal that the lower abdominal scar following caesarean section does not simply indicate the delivery of a live infant but also a long history of endometriosis resulting in extra dissection and tissue trauma impacting on pain management.

## Take a history

A brief targeted history yields the best results and allows efficient use of time.

Unlike other patient interactions, the early postoperative round often needs a tight focus. Ask the nursing staff and/or relatives, if present, for information.

Open-ended questions are optimal, i.e. how are you this morning? However, it may be necessary to ask some direct questions. For example, do you have a sore throat? Have you passed urine yet?

Specifically ask the patient if they have anything they wish to discuss about the anaesthesia or surgical experience. For example, it would be important to discover if the patient had been aware during the procedure.

## Examine the patient

Objectively review the patient after obtaining clues from the subjective history. Target the areas where you will gain maximum yield for benefit. For example:

- remove the covers and look at the surgical site. Consider number and size of incisions/port sites and possible impact on factors such as mobility, respiration, mentation and oral intake
- ask the patient to move, take a deep breath, cough and then auscultate the lungs. Optimising factors which improve respiratory function may reduce hypoxaemia. Can the obese patient sit at 45°?
- gently palpate the abdomen or move limbs, trunk, neck or joints depending on the patient's surgical experience. Consider if analgesia is adequate or could be improved.

## Troubleshoot the basics

The early postoperative round is an opportunity to ensure the basics have been met in the patient's management. For example:

- are adequate intravenous fluids charted?