



Perioperative Medicine

FOR THE JUNIOR CLINICIAN



with website



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Perioperative Medicine for the Junior Clinician

Perioperative Medicine for the Junior Clinician

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Foreword

Perioperative medicine has matured over the past two decades to become a major specialty. Ageing populations in many parts of the world are presenting for ever more complex surgeries in greater numbers, with multiple co-morbidities and exposed to polypharmacy. The pace of change has demanded the development of perioperative physicians who are uniquely trained and skilled at supporting patients through the surgical pathway. *Perioperative Medicine for the Junior Clinician* is a testament to the maturation of the specialty, a comprehensive introduction to all aspects of perioperative care.

The fact that there are over 100 succinct chapters, packed with information and written by international experts, emphasises the breadth and depth of knowledge required to practise medicine in this rapidly developing field. Perioperative medicine also requires collaboration between many specialties, something which is epitomised by the multidisciplinary nature of the contributors to this book.

Despite the development of this specialty, the junior doctor is often the first point of consultation in the perioperative period. It is essential that junior doctors understand perioperative risk factors and can identify evolving emergencies; they need to know when to escalate care and who to call for assistance. This book has been carefully organised to allow it to be consulted in a variety of situations, and the addition of short, accessible videos provides another dimension to assist in education, assessment and planning. *Perioperative Medicine for the Junior Clinician* is intended as an introduction and a guide for the junior doctor but it also serves as a definitive quick reference for the more expert practitioner. I (will) relish my copy.

Michael (Monty) Mythen

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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.

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About the companion website

This book is accompanied by a companion website:



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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



The role of the perioperative medicine physician

Mike Grocott

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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.

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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].

References

1. Weiser TG, Regenbogen SE, Thompson KD, et al. An estimation of the global volume of surgery: a modelling strategy based on available data. *Lancet*, 2008;**372**:139–144. doi:10.1016/S0140-6736(08)60878-8
2. Pearse RM, Moreno RP, Bauer P, et al. Mortality after surgery in Europe: a 7 day cohort study. *Lancet*, 2012;**380**(9847):1059–1065. doi:10.1016/S0140-6736(12)61148-9
3. Khuri SF, Henderson WG, DePalma RG, et al. Determinants of long-term survival after major surgery and the adverse effect of postoperative complications. *Annals of Surgery*, 2005;**242**(3):326–341; discussion 41–43. doi:10.1097/01.sla.0000179621.33268.83
4. Pearse RM, Holt PJ, Grocott MP. Managing perioperative risk in patients undergoing elective non-cardiac surgery. *BMJ*. 2011;**343**:d5759. doi:10.1136/bmj.d5759
5. Glance LG, Osler TM, Neuman MD. Redesigning surgical decision making for high-risk patients. *New England Journal of Medicine*, 2014;**370**(15):1379–1381. doi:10.1056/NEJMp1315538
6. Mirnezami R, Nicholson J, Darzi A. Preparing for precision medicine. *New England Journal of Medicine*, 2012;**366**(6):489–491. doi:10.1056/NEJMp1114866
7. Stacey D, Bennett CL, Barry MJ, et al. Decision aids for people facing health treatment or screening decisions. *Cochrane Database of Systematic Reviews*, 2011;**10**:CD001431. doi:10.1002/14651858.CD001431.pub3
8. Kwok AC, Semel ME, Lipsitz SR, et al. The intensity and variation of surgical care at the end of life: a retrospective cohort study. *Lancet*, 2011;**378**(9800):1408–1413. doi:10.1016/S0140-6736(11)61268-3
9. White SM, Griffiths R, Holloway J, Shannon A. Anaesthesia for proximal femoral fracture in the UK: first report from the NHS Hip Fracture Anaesthesia Network. *Anaesthesia*, 2010;**65**(3):243–248. doi:10.1111/j.1365-2044.2009.06208.x
10. Grocott MP. Improving outcomes after surgery. *BMJ*, 2009;**339**:b5173. doi:10.1136/bmj.b5173
11. Grocott MP, Pearse RM. Perioperative medicine: the future of anaesthesia? *British Journal of Anaesthesia*, 2012;**108**(5):723–726. doi:10.1093/bja/aes124

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).

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.



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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.

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/) [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].