21 Preoperative care including the high-risk surgi

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The date, place and time of operation should be matched with the availability of appropriately skilled personnel. Appropriate equipment and instruments should be made available. The operating list should be distributed as early as possible to all sta ff who are involved in making the list run smoothly (Table 21.12). If this is done electronically , familiarity with the computer system is required. A critical care bed should be prearranged for high-risk cases. Elective list order should prioritise patients who are vulnerable to long starvation times, e.g. children and or a prompt theatre start, planning patients with diabetes. F a straightforward case first can utilise time waiting for preprocedure imaging on the second case, e.g. breast wire insertion, or confirmation of a postoperative critical care bed for a high-risk case. List planning using a surgeon’s average operation times for a procedure rather than generic estimates leads to better list utilisation. Staggering admission times can improve patient satisfaction but reduces flexibility for ‘on the day’ changes to list order. /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

TABLE 21.12 Perioperative teams. Ward, theatre and specialist nursing staff Anaesthetic and surgical teams Radiology and pathology involvement Rehabilitation and social care workers Administration and scheduling team Speci /f_i c personnel in individual cases, e.g. cardiac devices team

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Despite more comorbid patients presenting for surgery , the perioperative mortality has decreased significantly over the last half century , especially in resource-rich countries. In a published systematic review in The Lancet by Bainbridge (2012), perioperative mortality has declined from 10 /uni00A0 603 per million (95% confidence interval [CI] 10 /uni00A0 423–10 /uni00A0 784) in the 1970s to 1176 per million (95%CI 1148–1205) in the 1990s /uni00A0 to 2000s (P < /uni00A0 0.0001). However, there remains a subgroup of patients who are at higher risk of morbidity and mortality after surgery . Patients who have a predicted mortality ≥ 5% should be considered as ‘high risk’. It is estimated that, although the high-risk group accounts for less than 15% of all surgical procedures, they contribute to more than 80% of all perioper ative deaths in UK. What causes these patients to be at a high risk of death and complications after surgery? After surgery tissue destruc tion, blood loss, fluid shifts and changes in temperature, pain and anxiety result in increased demands for o xygen delivery to the tissues. This demand increases from an average of 2 2 110 /uni00A0 mL/min/m at rest to 170 /uni00A0 mL/min/m in the postoper ative period. Most patients meet this increase in demand by increasing their cardiac output and tissue oxygen extraction. Patients who are unable to meet these demands, as a result of a limited cardiorespiratory reserve, are at a risk of oxygen debt. Occult hypovolaemia resulting from fluid shift or blood loss can further impair oxygen delivery . Splanchnic vasoconstric tion to compensate for this may result in gut ischaemia. Those with coronary or cerebrovascular disease are also at a higher risk of myocardial ischaemia or stroke. ASSESSMENT OF RISK

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The di ffi culty encountered when performing airway manoeu - vres, i.e. hand ventilation, intubation and front of neck access, can be predicted to some extent by simple examination. Failure to assess and plan airway management can have fatal consequences. The patient is assessed for: /uni25CF modified Mallampati class (Table 21.3); /uni25CF mouth opening >3 /uni00A0 cm (Figure 21.1); /uni25CF thyromental distance >6.5 /uni00A0 cm; /uni25CF thyrosternal distance >12.5 /uni00A0 cm; /uni25CF ability to protrude the jaw (Figure 21.2); /uni25CF ability to extend the head at the atlanto-occipital junction (Figure 21.3). An essay on the shaking palsy in 1817. When more than one of the above tests are abnormal, the chances of experiencing di ffi culty in obtaining and securing the airway become greater. Poor dentition, facial hair, upper airway tumours/scarring/infections, obesity and neck size are also important factors that will a ff ect the airway management plan. Previous anaesthetic charts or alerts carried by patients for a di ffi cult airway are invaluable sources when assessing a patient.

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Cardiopulmonary exercise testing

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CPET is the gold standard measurement of a patient’s fitness. The oxygen consumption (VO) and carbon dioxide produc 2 tion (VCO) of the patient are measured while they undergo 2 a 10-minute period of incrementally demanding exercise (usually on a cycle ergometer) up to their maximally tolerated level (Figure 21.9). CPET is based on the principle that, when a subject’s delivery of O to active tissues becomes inadequate, anaerobic 2 /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF metabolism begins; lactate is bu ff ered by bicarbonate and the resulting CO increases out of proportion to the escalation 2 in physical di ffi culty and O consumption. The ‘anaerobic 2 threshold’ (AT) is the VO in mL/kg/min at which this occurs. 2 Peak oxygen consumption is also measured. This is the end- product of a subject’s combined respiratory , cardiac, vascular and musculoskeletal fitness, and subjects with either an AT below 11 /uni00A0 mL/kg/min or a VO peak below 15 /uni00A0 mL/kg/min are 2 at higher risk of morbidity and mortality after major surgery . Patients who are found to be unfit can be enrolled in pre - habilitation. This involves supervised exercise over 4–6 weeks with the aim of improving the patient’s AT and reducing their risk profile. Where CPET is not available, the low-cost incremental shuttle walk test (ISWT) is an attractive option. It depends on the patient’s ability to walk at increasing speed over a flat surface. Patients who fail to achieve 350 metr es on the ISWT have been shown to be at higher risk for oesophageal surgery . It correlates well with VO peak but does not identify all low-risk 2 patients as it is subject to patient motivation and is a ff ected by - sex, age and height.

1 MET = 3.5 /uni00A0 mL O /kg/min (oxygen consumption by a 40-year

2 old, 70-kg man at rest) 1 MET = eating and dressing 4 METs = climbing two /f_l ights of stairs 6 METs = short run

> 10 METs = able to participate in strenuous sport Figure 21.9 Cardiopulmonary exercise testing (CPET). . Note

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Perioperative cardiovascular complications are frequent. Patients who can climb a flight of stairs without getting short - of breath, having chest pain or needing to stop are likely to tolerate a wide range of surgeries with an acceptable risk of perioperative cardiovascular morbidity and mortality . However, at preoperative assessment it is important to identify those patients who have a high perioperative risk of a major adverse cardiovascular event (MACE) and to try to reduce this risk. Patients at high risk are those with ischaemic heart disease (IHD), congestive cardiac failure, arrhythmias, severe peripheral vascular disease, cerebrovascular disease or signifi - cant renal impairment, especially if they are undergoing major intra-abdominal or intrathoracic surgery .
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Patients who have su ff ered a cerebrovascular accident have been shown to have a higher rate of MACE postoperatively . This is highest in the first 3 months after a stroke. The urgency of surgery needs to be discussed with the surgeon, anaesthetist and a stroke physician. Ideally elective surgery is postponed until MACE risks stabilise after 9 months. The bleeding versus thrombosis risk of continuing dual antiplatelet therapy needs to be considered. Cerebral vascular disease

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There are situations in which the selection of one surgical technique over another may be significantly influenced by patient risk factors. Some procedures are not primarily high risk but may become so in unsuitable patients. Laparoscopic surgery , for example, has come of age as a preferred technique for patients predisposed to postoperative respiratory complica tions, but its e ff ect on cardiac physiology means that the same may not apply to patients at risk of cardiac complications. The expanding demand and indications for minimal access surgery are now pushing the boundaries of intraoperative physiological tolerance. Robotic prostatectomy and some laparoscopic colorectal procedures require a pneumoperi toneum with steep Trendelenburg (head down) positioning for several hours (Figure 21.10). This can be associated with adverse cardiovascular and neurological complications, such as myocardial ischaemia and increased intracranial pressure in the high-risk group. This risk may be minimised by attention to patient selection. Choosing the right operation for the high-risk patient

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Drug-eluting coronary stents (DES)

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Primary percutaneous intervention is the treatment of choice for acute coronary syndromes, and many patients receive stents and are on dual antiplatelet therapy for 12 months. If surgery is absolutely necessary within the period of dual antiplatelet therapy , the management strategy should be decided jointly by the surgeon, cardiologist, anaesthetist and patient, as it is essential to consider the balance of risk of continuing antiplatelet agents (with the risk of increased bleeding) and stopping them (with the risk of stent thrombosis). Drug-eluting coronary stents (DES)

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Dysrhythmias

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In patients with atrial fibrillation (AF), β -blockers, digoxin or calcium channel blockers should be continued in order to control rate. New AF or atrial flutter should be investigated and treated. These patients should be considered for cardioversion as restoring sinus rhythm can improve cardiac output by 15% (Figure 21.5). Patients with an abnormal rhythm on ECG, for example tachycardia/bradycardia or heart block, should also be discussed with a cardiologist (Figure 21.6). Symptomatic heart), blocks and asymptomatic second- (Mobitz II) and third-degree heart blocks, if discovered at the preoperative assessment clinic, will need cardiology consultation and potentially temporary or permanent pacemaker insertion. Warfarin in patients with AF should be stopped 5 days preoperatively to achieve an international normalised ratio (INR) of 1.5 or less, which is safe for most surgery . The newer anticoagulants such as dabigatran (direct thrombin inhibitor) or rivaroxaban, apixaban and edoxaban (direct factor Xa inhibitors) do not have antagonists and must be stopped preoperatively , generally for 2–3 days in patients with normal renal function and longer when renal function is impaired. Alternative anticoagulation is not required in the perioperative

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V1 II V5 Figure 21.5 Atrial /f_l utter

period unless the risk of stroke is high (assessed using the CHA DS -V ASc [congestive heart failure, hypertension, age 2 2 ≥ 75 years, diabetes mellitus, stroke or transient ischemic attack, vascular disease, age 65–74 years, sex category] score). Decisions on bridging therapy should balance the risks of stroke and bleeding.

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EMERGENCY SURGERY

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In emergency surgery the principles of preoperative assessment should be the same as in elective surgery , except that the opportunity to optimise the condition of the patient is limited by time constraints. The urgency of surgery should be graded, e.g. by using the NCEPOD classification of intervention, and emergency theatre cases should be prioritised accordingly , i.e. immediate (within minutes), urgent (within hours), e xpedited (within days) or elective (timing to suit patient, hospital and sta ff). Medical assessment and treatments should be started even if there is no time to complete them before the start of a time-critical surgical procedure. Some risks may be reduced but some may persist; whenever possible, these need to be discussed with the patient during the consent process. Optimisation before urgent surgery can be more e ff ective in a critical care environment and patients may need to be admitted to critical care preoperatively . The likelihood of a high-risk emergency patient requiring postoperative critical care should be identified and discussed with the duty critical care physician. Summary box 21.3 Preoperative assessment for emergency surgery /uni25CF /uni25CF /uni25CF /uni25CF

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Endocrine and metabolic disorders

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Malnutrition Body mass index (BMI) is weight in kilograms divided by height in metres squared. A BMI of less than 18.5 indicates nutritional impairment and a BMI below 15 is associated with Thomas Addison , 1795–1860, physician, Guy’s Hospital, London, UK, described the e ff ects of disease of the suprarenal capsules in 1849. mum of 2 weeks before surgery is required to have any impact on subsequent morbidity . If a patient is unlikely to be able to ea t for a significant period postoperatively this can be anticipated and alternative nutritional support must be planned. Obesity Morbid obesity can be defined as BMI of more than 35 (other definitions exist) and is associated with an increased risk of postoperative complications. Patients should be made aware of the risks involved and advised on healthy eating and taking regular exercise. If possible, surgery should be delayed until the patient is more active and has lost weight. If this fails, - prophylactic measures need to be taken, such as preventative measures for acid aspiration and deep vein thrombosis (DVT). OSA that is unrecognised has been shown to be associated with a higher incidence of MACE in comorbid patient groups. Identification of those at higher risk by using a clinical scor - - ing system, such as the perioperative sleep apnoea prediction (P-SAP) scor e, can rationalise referral for formal sleep apnoea studies. Urgency of surgery may preclude full investigation and treatment preoperatively . Patients with severe OSA require 6 /uni00A0 weeks of nocturnal continuous positive airway pressure (CPAP) use preoperatively to reduce their risks. Associated risks need to be explained prior to the surgery and an appropriate anaesthetic technique planned with postoperative monitoring. Diabetes mellitus Diabetes and associated cardiovascular and renal complica - tions should be controlled to as near a normal level as possible before embarking on elective surgery . Any history of hyper- and hypoglycaemic episodes and hospital admissions should be noted. For elective surgery , an HbA1c of <69 /uni00A0 mmol/mol is recommended. Lipid-lowering medication should be started in patients who are in a high-risk group for cardiovascular - complications of diabetes. - Patients with diabetes should be first on the operating lobin list and their antidiabetic medication adjusted as per local or national guidance, as they will miss a meal preoperatively . Although tight control of blood sugar is not needed, the patient’s blood sugar le vels should be checked hourly . Variable rate intravenous insulin infusion (VRIII) should be started for patients with diabetes on insulin undergoing major surgery or if blood sugar is di ffi cult to control for other reasons. Adrenocortical suppression Patients receiving oral adrenocortical steroids should be asked about the dose and duration of the medication to determine the need for supplementation with extra doses of steroids periop - eratively so as to avoid an Addisonian crisis. A patient taking >5 /uni00A0 mg prednisolone equivalent within a month of surgery will require supplementation at induction and postoperatively . Neuroendocrine tumours, including phaeochromocytoma, carcinoid, gastrinoma, VIPomas and insulinoma, have specific treatments that must be started preoperatively in liaison with specialist endocrinology

physicians. Anaemia and blood transfusion Patients found to be newly anaemic (haemoglobin <130 /uni00A0 g/L), with an expected operative blood loss of >500 /uni00A0 mL, should be investigated for the cause of their anaemia. Any vitamin or iron deficiency should be corrected before proceeding for elective surgery . Chronic anaemia is well tolerated in the perioperative period where <500 /uni00A0 mL blood loss is expected, but where possible should be corrected. Preoperative transfusion may be considered rarely for elective patients when guided by a haematologist. Local policy should agree which procedures require a preoperative ‘group and save’ or cross-matched blood sample. Some patients may refuse blood transfusion, for example a Jehovah’s Witness. In such a case, during the consent process discussion should include which blood product and/or system (e.g. cell salvage, reinfusion from drains) is acceptable. The discussion should extend to other areas, for example whether refusal of transfusion would apply in life-threatening situations. As in all consent processes, the discussion and out come should be clearly documented. Thrombophilia Factor V Leiden and deficiencies in antithrombin III and proteins C and S increase the patient’s thrombosis risk. The patient will need special discussion with a haematologist to tailor their venous thromboembolism prophylaxis. For all other patients a DVT risk assessment should be made preoperatively and precautions planned as per local or national guidance. Risk factors are included in Table 21.4 . The progesterone-only contraceptive pill should be contin ued; however, the risks of continuing the combined pill (slight increased risk of significant thr ombosis) should be weighed against the risks of an unplanned pregnancy . Consider stop ping oestrogen-containing oral contraceptives or hormone replacement therapy 4 weeks before surgery (NICE guidance; see Further reading). Bleeding disorders Bleeding disorders such as haemophilia, von Willebrand disease or thrombocytopenia are best discussed with haema tology preoperatively . Endocrine and metabolic disorders

Malnutrition Body mass index (BMI) is weight in kilograms divided by height in metres squared. A BMI of less than 18.5 indicates nutritional impairment and a BMI below 15 is associated with Thomas Addison , 1795–1860, physician, Guy’s Hospital, London, UK, described the e ff ects of disease of the suprarenal capsules in 1849. mum of 2 weeks before surgery is required to have any impact on subsequent morbidity . If a patient is unlikely to be able to ea t for a significant period postoperatively this can be anticipated and alternative nutritional support must be planned. Obesity Morbid obesity can be defined as BMI of more than 35 (other definitions exist) and is associated with an increased risk of postoperative complications. Patients should be made aware of the risks involved and advised on healthy eating and taking regular exercise. If possible, surgery should be delayed until the patient is more active and has lost weight. If this fails, - prophylactic measures need to be taken, such as preventative measures for acid aspiration and deep vein thrombosis (DVT). OSA that is unrecognised has been shown to be associated with a higher incidence of MACE in comorbid patient groups. Identification of those at higher risk by using a clinical scor - - ing system, such as the perioperative sleep apnoea prediction (P-SAP) scor e, can rationalise referral for formal sleep apnoea studies. Urgency of surgery may preclude full investigation and treatment preoperatively . Patients with severe OSA require 6 /uni00A0 weeks of nocturnal continuous positive airway pressure (CPAP) use preoperatively to reduce their risks. Associated risks need to be explained prior to the surgery and an appropriate anaesthetic technique planned with postoperative monitoring. Diabetes mellitus Diabetes and associated cardiovascular and renal complica - tions should be controlled to as near a normal level as possible before embarking on elective surgery . Any history of hyper- and hypoglycaemic episodes and hospital admissions should be noted. For elective surgery , an HbA1c of <69 /uni00A0 mmol/mol is

recommended. Lipid-lowering medication should be started in patients who are in a high-risk group for cardiovascular - complications of diabetes. - Patients with diabetes should be first on the operating lobin list and their antidiabetic medication adjusted as per local or national guidance, as they will miss a meal preoperatively . Although tight control of blood sugar is not needed, the patient’s blood sugar le vels should be checked hourly . Variable rate intravenous insulin infusion (VRIII) should be started for patients with diabetes on insulin undergoing major surgery or if blood sugar is di ffi cult to control for other reasons. Adrenocortical suppression Patients receiving oral adrenocortical steroids should be asked about the dose and duration of the medication to determine the need for supplementation with extra doses of steroids periop - eratively so as to avoid an Addisonian crisis. A patient taking >5 /uni00A0 mg prednisolone equivalent within a month of surgery will require supplementation at induction and postoperatively . Neuroendocrine tumours, including phaeochromocytoma, carcinoid, gastrinoma, VIPomas and insulinoma, have specific treatments that must be started preoperatively in liaison with specialist endocrinology physicians. Anaemia and blood transfusion Patients found to be newly anaemic (haemoglobin <130 /uni00A0 g/L), with an expected operative blood loss of >500 /uni00A0 mL, should be investigated for the cause of their anaemia. Any vitamin or iron deficiency should be corrected before proceeding for elective surgery . Chronic anaemia is well tolerated in the perioperative period where <500 /uni00A0 mL blood loss is expected, but where possible should be corrected. Preoperative transfusion may be considered rarely for elective patients when guided by a haematologist. Local policy should agree which procedures require a preoperative ‘group and save’ or cross-matched blood sample. Some patients may refuse blood transfusion, for example a Jehovah’s Witness. In such a case, during the consent process discussion should include which blood product and/or system (e.g. cell salvage, reinfusion from drains) is acceptable. The discussion should extend to other areas, for example whether refusal of transfusion would apply in life-threatening situations. As in all consent processes, the discussion and out come should be clearly documented. Thrombophilia Factor V Leiden and deficiencies in antithrombin III and proteins C and S increase the patient’s thrombosis risk. The patient will need special discussion with a haematologist to tailor their venous thromboembolism prophylaxis. For all other patients a DVT risk assessment should be made preoperatively and precautions planned as per local or national guidance. Risk factors are included in Table 21.4 . The progesterone-only contraceptive pill should be contin ued; however, the risks of continuing the combined pill (slight increased risk of significant thr ombosis) should be weighed against the risks of an unplanned pregnancy . Consider stop ping oestrogen-containing oral contraceptives or hormone replacement therapy 4 weeks before surgery (NICE guidance; see Further reading). Bleeding disorders Bleeding disorders such as haemophilia, von Willebrand disease or thrombocytopenia are best discussed with haema tology preoperatively .

Examination

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Patients should be treated with respect and dignity , receive a clear explanation of the examination undertaken and be kept as comfortable as possible. A chaperone should be present, especially for intimate examinations. This should be part of a local guideline or policy . /uni25CF James Parkinson , 1755–1824, general practitioner of Shoreditch, London, UK, published SR Mallampati published the original article suggesting that the size of the base of the tongue is an important factor in determining the degree of di ffi culty of direct laryngoscopy in the Canadian Anaesthetists' Society Journal in 1985. The original Mallampati classification was modified from a total of three to four classes by GLT Samsoon and JRB Y oung after reviewing a series of obstetric and general surgical patients who had had di ffi cult intubations. Examination /uni25CF /uni25CF /uni25CF /uni25CF Examination is especially important in symptomatic individuals and at a minimum should include cardiorespiratory examination and airway assessment. Specifically , look for signs of heart failure, valvular heart disease, peripheral vascular disease and respiratory disease (Table 21.2).

Cardiovascular Valvular heart disease Ischaemic heart disease: angina, myocardial infarction, coronary stents Hypertension Heart failure Dysrhythmia Peripheral vascular disease Cardiac devices, i.e. permanent pacemaker Respiratory Chronic obstructive pulmonary disease Asthma Respiratory infections Obstructive sleep apnoea symptoms Gastrointestinal Peptic ulcer disease and gastro-oesophageal re /f_l ux Liver disease Genitourinary tract Urinary tract infection Renal dysfunction For females last menstrual period/pregnancy/breastfeeding status Neurological Epilepsy Cerebrovascular accidents and transient ischaemic attacks Parkinson's disease Multiple sclerosis Psychiatric disorders Cognitive function Anxiety or depression Endocrine/metabolic Diabetes Thyroid dysfunction Phaeochromocytoma Porphyria Locomotor system Osteoarthritis In /f_l ammatory arthropathy, i.e. rheumatoid arthritis Disorders of muscle, i.e. muscular dystrophy, myasthenia, myopathy Haematological Bleeding disorders Personal or family history of deep vein thrombosis and pulmonary embolism Objection to blood product transfusion Haemoglobinopathy, i.e. sickle cell disease Infection Human immunode /f_i ciency virus/hepatitis/tuberculosis Other, i.e. MRSA/COVID-19/drug-resistant organisms Previous surgery and anaesthesia Problems encountered, i.e. Dif /f_i cult Airway Society Alert, suxamethonium apnoea Family history of problems with anaesthesia, i.e. malignant hyperpyrexia COVID-19, coronavirus disease 2019; MRSA, methicillin-resistant Staphylococcus aureus . General: positive /f_i ndings, even if not related to the proposed procedure, should be explored further Surgery related: type and site of surgery, with reference to imaging and investigations Systemic: comorbidities and extent of limitation of each organ's function Speci /f_i c: for example, suitability for positioning during surgery or to plan airway management TABLE 21.2 Medical examination. General Anaemia, jaundice, cyanosis, frailty,

nutritional status, sources of infection (teeth, feet, leg ulcers), height, weight and BMI Cardiovascular Pulse rate and rhythm, blood pressure, heart sounds, bruits, jugular venous pressure, peripheral oedema, exercise tolerance Respiratory Respiratory rate and effort, chest expansion and percussion note, breath sounds, oxygen saturation at rest and exertion, consider PEFR Gastrointestinal Abdominal masses, ascites, bowel sounds, hernia, genitalia Neurological Consciousness level, cognitive function, sensation, muscle power, tone and re /f_l exes Airway Mouth opening, neck extension, Mallampati assessment score, thyromental distance, jaw pr otrusion, scarring to mouth or neck, dentition BMI, body mass index; PEFR, peak expiratory /f_l ow rate.

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FURTHER READING

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Bainbridge D, Martin J, Arango M, Cheng D; for the Evidence-based Peri-operative Clinical Outcomes Research (EPiCOR) Group. Perioperative and anaesthetic-related mortality in developed and developing countries: a systematic review and meta-analysis. Lancet 2012; 380 (9847): 1075–81. Barker P , Creasey PE, Dhatariya K et al . Peri-operative management of the surgical patient with diabetes. Anaesthesia 2015; 70 (12): 1427–40. Boyd O, Jackson N. How is risk defined in high-risk surgical patient management? Crit Care 2005; 9 : 390–6. Chan MTV , Wang CY , Edwin S et al . Association of unrecognized obstructive sleep apnoea with postoperative cardiovascular events in patients undergoing major non cardiac surgery . JAMA 2019; 321 (18): 1788–98. Department of Health. Mental Capacity Act (MCA). England and Wales . London: HMSO, 2005. Duminda N, Wijeysundera W , Beattie S et al . Integration of the Duke Activity Status Index into preoperative risk evaluation: a multicentre prospective cohort study . Br J Anaesth 2020; 124 (3): 261–70. Fleisher L, Fleischmann K, Auerback A et al . 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2014; 64 (22): e77–e137. from https://www .gmc-uk.org/ethical-guidance/ethical-guidance- for-doctors/decision-making-and-consent. Gri ffi ths R, Beech F , Brown A et al . Peri-operative care of the elderly 2014. Anaesthesia. 2014; 69 : 81–98. Gri ffi ths R, Babu S, Dixon S et al . Guideline for the management of hip fractures 2020. Anaesthesia 2021; 76 : 225–37. Hartle A, McCormack T , Carlisle J et al . The measurement of adult blood pressure and management of

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Factors contributing to risk

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Risk is a complex interaction of multiple factors that can be classified into patient and surgical factors. Patient factors are listed in Table 21.6 . The elderly , although not independently at higher risk, not only have more cardiac, pulmonary and renal disease but also require surgery four times as often as the rest of the population. Around 10% of the population over 65 are frail, with increasing incidence associated with age. Multiple body systems lose their in-built reserves in the elderly . The type of surgery contributes independently and is listed in Table 21.7 . This risk increases if the surgery is performed as an emergency . Often, the underlying condition requiring surgery itself ma y be associated with an increased risk of complications. For example, a patient with severe peripheral vascular disease resulting from heavy smoking may need a femoral–popliteal bypass graft and can be expected also to have significant COPD and IHD. Moreover, when mortality by type of surgery is adjusted for patient risk factors, the apparent hierarchy of surgical risk may change. The average mortality risk for an individual patient undergoing thoracic surgery , for example, is likely to be higher than the average risk for that same patient undergoing vascular surgery . Complications associated with the latter are greater medical risk factors (Table 21.8). /uni25CF /uni25CF et al. /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF - - - -

TABLE 21.6 Patient factors that predispose to high risk of morbidity and mortality. Previous severe cardiorespiratory illness, e.g. acute myocardial infarction, COPD or stroke Late-stage vascular disease involving the aorta Age >70 years with limited physiological reserve in one or more vital organs Extensive surgery for carcinoma Acute abdominal catastrophe with haemodynamic instability (e.g. peritonitis) Acute massive blood loss >8 units Septicaemia Positive blood culture or septic focus Respiratory failure: PaO <8 /uni00A0 kPa or F O

> 0.4 or mechanical 2 i 2 ventilation >48 hours Acute renal failure: urea >20 /uni00A0 mmol or creatinine >260 /uni00A0 mmol/L COPD, chronic obstructive pulmonary disease; F O , fraction of i 2 inspired oxygen; PaO , arterial oxygen partial pressure. 2 Based on clinical criteria used by Shoemaker and colleagues, modi

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/f_i ed by Boyd. TABLE 21.7 Surgery-speci /f_i c estimates of risk. High risk (cardiac risk Intermediate risk Low risk (cardiac

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> 5%) (cardiac risk 1–5%) risk <1%) Open aortic Elective abdominal Breast Major vascular Carotid Dental Peripheral vascular Endovascular Thyroid Urgent body cavity Aneurysm Ophthalmic Head and neck Gynaecological Major neurosurgery Reconstructive Arthroplasty Minor orthopaedic Elective pulmonary Minor urology Major urology From Eagle KA, Berger PB, Calkins H et al .; American College of Cardiology; American Heart Association. ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery: executive summary: a report of the American College of Cardiology/ American Heart Association evaluation for noncardiac surgery. J Am Coll Cardiol 2002; 39 (3): 542–53. TABLE 21.8 The effect of adjustment for patient factors on surgery-speci /f_i c operative mortality. Type of surgery Unadjusted 30-day Adjusted 30-day mortality (% (rank)) mortality (%(rank)) 0.98 (5) 5.97 (1) Vascular 2.28 (1) 3.40 (2) Thoracic 1.83 (2) 2.73 (3) Abdominal 1.13 (4) 2.70 (4) Cardiac 1.60 (3) 1.74 (5) Neurosurgery 0.49 (7) 1.25 (6) Orthopaedic 0.68 (6) 0.85 (7) Ear–nose–throat 0.38 (8) 0.81 (8) Urology 0.17 (9) 0.13 (9) Gynaecology 0.08 (10) 0.07 (10) Breast Modi /f_i ed from Noordzij et al . (2010).

Scores predicting mortality Scores not requiring ASA operative information APACHE-II Hardman index Glasgow aneurysm score Surgical Outcome Risk Tool (SORT) Boey score Hacetteppe score Physiological POSSUM ACS NSQIP surgical risk score Scores requiring operative Mannheim peritonitis index information NELA score Reiss index Fitness score POSSUM P-POSSUM Cleveland colorectal model Surgical risk scale ACS NSQIP , American College of Surgeons National Surgical Quality Improvement Programme; APACHE-II, Acute Physiology and Chronic Health Evaluation II; ASA, American Society of Anesthesiologists; NELA, National Emergency Laparotomy Audit; POSSUM, Physiologic and Operative Severity Score for the enUmeration of Mortality and Morbidity; P-POSSUM, Portsmouth-POSSUM; VA, Veterans Affairs. Modi /f_i ed from Rix TE, Bates T. Pre-operative risk scores for the prediction of outcome in elderly people who require emergency surgery. J Emerg Surg 2007; 2 : 16.

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/f_i ed by Boyd. TABLE 21.7 Surgery-speci /f_i c estimates of risk. High risk (cardiac risk Intermediate risk Low risk (cardiac

> 5%) (cardiac risk 1–5%) risk <1%) Open aortic Elective abdominal Breast Major vascular Carotid Dental Peripheral vascular Endovascular Thyroid Urgent body cavity Aneurysm Ophthalmic Head and neck Gynaecological Major neurosurgery Reconstructive Arthroplasty Minor orthopaedic Elective pulmonary Minor urology Major urology From Eagle KA, Berger PB, Calkins H et al .; American College of Cardiology; American Heart Association. ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery: executive summary: a report of the American College of Cardiology/ American Heart Association evaluation for noncardiac surgery. J Am Coll Cardiol 2002; 39 (3): 542–53. TABLE 21.8 The effect of adjustment for patient factors on surgery-speci /f_i c operative mortality. Type of surgery Unadjusted 30-day Adjusted 30-day mortality (% (rank)) mortality (%(rank)) 0.98 (5) 5.97 (1) Vascular 2.28 (1) 3.40 (2) Thoracic 1.83 (2) 2.73 (3) Abdominal 1.13 (4) 2.70 (4) Cardiac 1.60 (3) 1.74 (5) Neurosurgery 0.49 (7) 1.25 (6) Orthopaedic 0.68 (6) 0.85 (7) Ear–nose–throat 0.38 (8) 0.81 (8) Urology 0.17 (9) 0.13 (9) Gynaecology 0.08 (10) 0.07 (10) Breast Modi /f_i ed from Noordzij et al . (2010).

Scores predicting mortality Scores not requiring ASA operative information APACHE-II Hardman index Glasgow aneurysm score Surgical Outcome Risk Tool (SORT) Boey score Hacetteppe score Physiological POSSUM ACS NSQIP surgical risk score Scores requiring operative Mannheim peritonitis index information NELA score Reiss index Fitness score POSSUM P-POSSUM Cleveland colorectal model Surgical risk scale ACS NSQIP , American College of Surgeons National Surgical

Quality Improvement Programme; APACHE-II, Acute Physiology and Chronic Health Evaluation II; ASA, American Society of Anesthesiologists; NELA, National Emergency Laparotomy Audit; POSSUM, Physiologic and Operative Severity Score for the enUmeration of Mortality and Morbidity; P-POSSUM, Portsmouth-POSSUM; VA, Veterans Affairs. Modi /f_i ed from Rix TE, Bates T. Pre-operative risk scores for the prediction of outcome in elderly people who require emergency surgery. J Emerg Surg 2007; 2 : 16.

Gastrointestinal disease

Gastrointestinal disease

Regurgitation risk Patients undergoing general anaesthesia or sedation have - a risk of regurgitation of stomach contents and aspiration pneumonia. To reduce this risk patients should fast preoperatively . This should be clearly explained to the patient: 6 hours for solids or non-clear fluids (e.g. milk), 2 hours for clear fluids and 4 /uni00A0 hours for infants consuming breast milk. encouraged. Patients with hiatus hernia, obesity , pregnancy or diabetes are at higher risk of pulmonary aspiration, even if they have been fasted appropriately before elective surgery . Clear antacids, H -receptor blockers, e.g. ranitidine, or proton pump 2 inhibitors, e.g. omeprazole, may be given at an appropriate time in the preoperative period to reduce stomach acidity . Liver disease In patients with liver disease, the cause of the disease needs to be known, as well as any evidence of clotting problems, renal involvement and encephalopathy . Elective surgery should be postponed until any acute episode has settled, e.g. cholangitis. The presence of ascites, oesophageal varices, hypoalbuminae mia or sodium and water retention should be noted, as all can influence the choice and outcome of anaesthesia and surgery . Patients with cirrhosis undergoing major surgery have a very high mortality; the Model for End-stage Liver Disease (MELD) can be used to predict mortality of cirrhotic patients undergo ing non-transplant surgery . If alcohol addiction is the aetiology then reduction of alcohol intake should be encouraged but abstinence must be medically supervised to prevent delirium tremens. Gastrointestinal disease

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Genitourinary disease

Genitourinary disease

Renal failure Underlying conditions leading to chronic renal failure such as diabetes mellitus, hypertension and IHD should be stabilised before elective surgery . Appropriate measures should be taken to treat acidosis, hypocalcaemia and hyperkalaemia of greater than 6 /uni00A0 mmol/L. Arrangements should be made to continue peritoneal dialysis or haemodialysis until a few hours before surgery . After the final dialysis before surgery , a blood sample should be sent for FBC and U&Es. Patients with chronic renal failure often have chronic anae mia that is well tolerated; therefore, preoperative blood trans fusion is often not necessary . Optimisation of the haemog is best guided by the renal team. Urinary tract infection Uncomplicated urinary tract infections are common in women, while outflow uropathy with chronically infected urine is common in men. These infections should be treated before embarking on elective surgery where infection carries dire consequences, e.g. joint replacement. For emergency procedures, antibiotics should be started and care taken to ensure that the patient maintains a good urine output before, during and after surgery . Genitourinary disease

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Heart failure

Heart failure

Left ventricular failure is the end result of several conditions, including IHD, hypertension, cardiomyopathies and valve dysfunction. Decompensated heart failure puts the patient at risk of multiorgan failure. Those with ejection fractions of less than 35%, and in whom the failure is undiagnosed or its severity underestimated, are at highest risk. The patient’s functional capacity needs to be assessed and surgery may have to be delayed for investigations such as an echo and/or for optimisation of medical therapy . B-type natriuretic peptide is a useful marker and can be prognostic. Drugs used in chronic heart failure can have significant implications for perioperative care, including intraoperative hypotension. β -blockers and probably ACE inhibitors (unless renal perfusion is to be significantly a ff ected) should Woldemar Mobitz , 1889–1951, Russian–German physician, researched atrioventricular dissociation and heart blocks. 35% should be discussed with a cardiologist and optimised. Cardiac resynchronisation therapy devices may be considered, depending on the QRS duration. Heart failure

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Implanted pacemakers and cardiac defibrillators

Implanted pacemakers and cardiac defibrillators

Checks and appropriate reprogramming should be done preoperatively by specialists and advice followed. Monopolar diathermy activity during surgery may be sensed by the pace maker as ventricular fibrillation or a paced beat. Therefore, cardioversion and over-pace modes must be turned o ff (and switched back on after surgery) or converted to ‘ventricle paced, not sensed with no response to sensing’ (VOO) mode. Bipolar diathermy should be made available at surgery .
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Introduction

INTRODUCTION

The stress of major surgery can lead to increased oxygen demand by up to 40%. Inflammatory changes due to cytokine release, endocrine responses, hypercoagulability and redistribution of fluid between compartments may last several postoperative days. The purpose of careful preoperative planning is to minimise the unwanted e ff ects of these physiological changes. Systematic history taking, examination and investigation at the preoperative clinic should include not only an assessment of functional reserve but also the form ulation of advice on optimisation, to best cope with the anticipated operative stress. Primary care physician records and hospital notes are useful sources of baseline information. Ideally a multidisciplinary team approach, including the primary care physician, specialist nurses, physiotherapist, dietician and perioperative physician, is utilised. This allows optimisation of chronic conditions, facilitates weight reduction and smoking cessation, and allows coordination of prehabilitation and postoperative rehabili- tation needs. The anaesthetist and surgeon must plan the safest anaesthetic technique and operation for the patient. A simple questionnaire can identify risk factors for patients undergoing surgery that will require specific tests or optimisation. Patients with severe comorbidities or undergoing high-risk surgery should be r eferred to specialists to quantify and reduce perioperative risks. The risks of surgery and Summary box 21.1 Preoperative plan for the best patient outcomes /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF anaesthesia and the e ff ects of comorbid conditions should be discussed so that the patient can make an informed decision. Patients should be given advice on preoperative fasting times, adjustments to regular medication and specific premedication at the preoperative visit. To enable the list to run smoothly on the day , key personnel involved in the list (surgeon, anaesthetist and senior theatre sta ff) should be involved in planning the list order. The National Patient Safety Agency’s adaptation of the World Health Organization’s checklist recommends a ‘team brief ’ before the start of each list, which is also a valuable opportunity to share information with the theatre team and improve the safety of anaesthesia and surgery .

Gather and record all relevant information Optimise patient condition Choose surgery that offers minimal risk and maximum bene /f_i t Informed consent of the patient (see Chapter 14) Anticipate and plan for adverse events Adequate hydration, nutrition and exercise are advised Importance of critical care in management • Emergency cases • To be able to organise preoperative care and the operating list

Investigations

Investigations

Guidelines produced by the UK’s National Institute for Health and Care Excellence (NICE) set out the investigations needed for various categories of elective surgery and American Society of Anesthesiologists (ASA) score of the patient. The following are some of the tests done preoperatively , although not all are done routinely or are recommended by NICE. /uni25CF Full blood count (FBC) . An FBC is needed for major operations, in the elderly and in those with anaemia or pathology with ongoing blood loss and chronic disease.

Figure 21.2 Ability to protrude jaw.

Figure 21.3 Normal head extension.

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consented for a urine/ serum pregnancy test. /uni25CF Others : /uni25CF Venous bicarbonate . For patients who have screened as being at high risk for obstructive sleep ap noea (OSA). Followed by formal sleep studies if signifi cant OSA is a concern. /uni25CF Arterial blood gases . A low-cost tool that can give quick and vital information in acute or chronic severe respiratory conditions, acid–base disturbances and conditions where there is a changing milieu, e.g. immediately before kidney transplant. loss >500 /uni00A0 mL. /uni25CF Methicillin-resistant Staphylococcus aureus (MRSA) swabs. /uni25CF Coronavirus 2019 (COVID-19) polymerase chain reaction (PCR) swabs. /uni25CF Spirometry . /uni25CF Cardiopulmonary exercise testing to assess fit- ness for high-risk surgery . /uni25CF Specialist radiological views are sometimes re - quired. If imaging is going to be needed during sur - gery , this needs to be planned in advance. Investigations

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Ischaemic heart disease

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Patients with angina that is not well controlled should be inves - tigated further by a cardiologist. The indications for coronary - revascularisation in patients awaiting surgery are the same as at any other time. Pharmacological protection is indicated. - Patients established on β -blockers and statins should have their medication continued perioperatively . Initiating statins preoperatively should be considered if not already prescribed. Most long-term cardiac medications should be continued over the perioperative period. Angiotensin-converting enzyme (ACE) inhibitors and receptor blockers are often omitted 24 hours prior to surgery to prevent intraoperative hypotension, - and restarted the next day for most surgery . - In patients with IHD the cardiac and coronary reserve can be evaluated using a stress test (stress ECG, stress echo, myocardial scintigraphy). The tests have a high negative predictive value but a relatively low positive predictive value. If the test is negative, the patient is unlikely to have IHD; conversely , if it is positive the chances of the patient actually having IHD are not necessarily very high, but there is a need for further investigation such as coronary angiography or cardiac computed tomography . Recently , measurement of the coronary fractional flow reserve during coronary angiography using a pressure wire has made it possible to identify coronary lesions that have the largest impact on myocardial perfusion. After a proven myocardial infarction (MI) (Figure 21.4 elective surgery should be postponed for 3–6 months to reduce the risk of perioperative reinfarction. Ischaemic changes can be seen on ECG e ven if the patient is not symptomatic (silent ischaemia/silent MI). These merit discussion with a cardiologist.

V4 V1 V5 V2 V6 V3 Figure 21.4 Preoperative electrocardiogram of a patient who com plained of chest pain the previous day, showing recent transmural anterior myocardial infarction with Q waves and ST elevation.

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Learning objectives

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To understand preoperative preparation for surgery: Surgical, medical and anaesthetic aspects of assessment • How to optimise patients and identify those at • higher risk Learning objectives

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Musculoskeletal disorders

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Muscular disorders have serious implications and require a tailored anaesthetic approach. They include muscular dystrophies, myotonic dystrophy and myasthenia gravis and a personal or family history of malignant hyperpyrexia. Rheumatoid arthritis can lead to an unstable cervical spine with the possibility of spinal cord injury during intubation. Therefore, flexion and extension lateral cervical spine radiographs should be obtained in symptomatic patients (Figures 21.7 and 21.8). Assessment of the severity of renal, - cardiac, valvular and pericardial involvement as well as restrictive lung disease should be carried out. Rheumatologists will advise on steroids and disease-modifying drugs so as to - balance immunosuppression (chance of infections) against the need to stabilise the disease perioperatively (stopping disease- modifying drugs can lead to flare-up of the disease). In patients with ankylosing spondylitis, in addition to the problems discussed above, techniques of spinal or epidural anaesthesia are often challenging. Patients with systemic lupus erythematosus may e xhibit a hypercoagulable state along with - airway di ffi culties.
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Neurological and psychiatric disorders

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Anticonvulsants and anti-Parkinson’s medication must be continued perioperatively to help early mobilisation of the patient, and patients should be planned early on a theatre list to reduce starvation times. Parenteral medication plans can be set in place preoperatively if there is potential for a prolonged ‘nil by mouth’ period postoperatively . Lithium should be stopped 24 hours prior to major sur gery but can be continued for minor surgery with careful fluid management and U&Es monitoring. The anaesthetist should be informed if patients are on psyc hiatric medications, such Erik Adolf von Willebrand , 1870–1949, physician, Diakonissanstaltens Hospital, Helsinki, (Helsingfors), Finland, described hereditary pseudohaemophilia in 1926. /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF as tricyclic antidepressants or monoamine oxidase inhibitors (MAOIs), as these may interact with anaesthetic drugs. Case- device by-case decisions with a psychiatrist must be undertaken as stopping irreversible MAOIs safely may take many weeks of planning under psychiatric supervision. -

Age >60 years 2 Obesity (BMI >30 kg/m) Trauma or surgery (especially of the abdomen, pelvis and lower limbs) Total anaesthesia time >90 minutes Reduced mobility for more than 3 days Pregnancy/puerperium Varicose veins with phlebitis Drugs, e.g. oestrogen contraceptive, HRT, smoking Known active cancer or on treatment, signi /f_i cant medical comorbidities, critical care admission Family/personal history of thrombosis, e.g. de /f_i ciencies in antithrombin III, protein S or C BMI, body mass index; HRT, hormone replacement therapy.

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PHYSICAL FITNESS

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Functional physical fitness can be judged by the ability to tolerate metabolic equivalent tasks (METs) (Table 21.5). One MET is equivalent to the oxygen consumption of an adult at rest (~3.5 /uni00A0 mL/kg/min). Di ff erent tasks are assigned a number of METs. If the patient is able to perform >4 METs (e.g. climb - ing at least one flight of stairs) they are accepted to proceed for low-risk surgery in the USA and Europe. However this - depends on a subjective assessment of the ability of a patient and may be overestimated by them. The Duke Activity Status Index (DASI) is a less subjective patient questionnaire. An estimate of the patient’s peak oxygen consumption (VO peak) 2 can be calculated from their point score. Although it correlates with cardiopulmonary exercise testing (CPET), some patients who score poorly on DASI go on to score well on CPET . An objective measure of fitness is required for high-risk surgery .

Figure 21.7 Extension view of the cervical spine in a patient with rheumatoid arthritis. Arrow indicates the atlantodens interval. Figure 21.8 Flexion view in the same patient as in Figure 21.7 the large increase in the atlantodens interval (arrow), implying signi /f_i cant instability at this level.

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Respiratory disease

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Postoperative respiratory complications, such as pneumonia, are a major cause of morbidity and mortality , especially after major abdominal and thoracic surgery . A patient’s current respiratory status should be compared with their ‘normal state’. Patients with severe disease are at risk of pneumonia and respiratory failure in the postoperative period. Severe disease would include patients with a forced expiratory volume in the first second (FEV) of less than 30% of predicted value, depen - 1 dence on oral steroid treatment, home ventilation or oxygen therapy or a PaCO level of greater than 6 /uni00A0 kPa. 2 Patients should continue to use their regular inhalers until the start of anaesthesia. Brittle asthmatics may also need extra steroid cover. Encourage the patients to be compliant with the medications and stop smoking . Information should be provided to indicate perioperative risks associated with smoking. Stop - ping smoking reduces carbon monoxide levels and o ff ers the - patient a better ability to clear sputum. Evidence suggests that preoperative inspiratory muscle training significantly improves respiratory (muscle) function in the early postoperative period, reducing the risk of pulmonary complications. Regional anaesthetic techniques and less invasive surgical options should be considered in severe cases. Elective surgery should be postponed until acute exacerbations are treated. The patient should be refer red to a respiratory physician if: - /uni25CF there is a severe disease or significant deterioration; /uni25CF major surgery is planned in a patient with significant respi - ratory comorbidities; /uni25CF right heart failure is present – dyspnoea, fatigue, tricuspid regurgitation, hepatomegaly and oedematous feet; /uni25CF the patient is young and has severe respiratory problems (may indicate a rare condition). Respiratory disease

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Risk prediction

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The key to managing patients e ff ectively is the identification and accurate quantification of the risk, and subsequent measures taken to minimise it. Realistic estimates of risk are the cornerstone of informed patient consent and shared decision making. The patient and the surgeon may choose a less extensive or even a non-surgical option when the risks of the definitive procedur e are deemed to be too high or unacceptable. The Royal College of Surgeons of England has recommended that patients who are predicted to have >5% mortality risk should have active consultant input in all stages of their management. Surgical procedures in those with predicted mortality of >10% should be conducted under the direct supervision of a consultant surgeon or anaesthetist, unless the consultants are satisfied with the seniority and com petence of the sta ff managing these patients. Moreover, those with a mortality >10% should be managed in the critical care facility postoperatively . The identification of patients who will benefit the most from these interventions is important, not only for the improvement of outcomes but also for the e ff ective allo cation of resources. A number of scoring systems have been developed over the years with the aim of identifying high-risk patients (Table 21.9 American Society of Anesthesiologists system The ASA scoring system is widely used. Although not designed to be used as a risk prediction score, it has a quantitative association with the predicted percentage of postoperative Lee Goldman , b. 1948, Dean of Health Sciences and Medicine, Columbia University , New Y ork, NY , USA, since 2006. He developed his index in 1977. mortality (Table 21.10). However, it does not account for the patient’s age or the nature of the surgery and the term ‘systemic disease’ in ASA grading introduces an element of ‘subjectivity’. Examples of each physical status added in 2015 aim to reduce this. The POSSUM score The POSSUM (Physiologic and Operative Severity Score for the enUmeration of Mortality and Morbidity) and its modi - fications (P-POSSUM, CR-POSSUM) are used to predict all-cause mortality in postoperative critical care patients as well as non-cardiac morbidity . - -).

Scores predicting morbidity ASA APACHE-II Revised Cardiac Risk Index (RCRI) Veltkamp score VA respiratory failure score VA pneumonia prediction index ACS NSQIP surgical risk score POSSUM P-POSSUM W orld TABLE 21.10 Operative mortality by American Society of Anesthesiologists (ASA) grade. ASA Description 30-day grade mortality (%) 0.1 Healthy I 0.7 Mild systemic disease, no functional II limitation 3.5 Severe systemic disease, de /f_i nite III functional limitation 18.3 Severe systemic disease, constant IV threat to life 93.3 Moribund patient unlikely to survive 24 V hours with or without operation – Emergency operation E From Boyd and Jackson (2005).

Lee’s Revised Cardiac Risk index (RCRI) uses objective indices based on weighted scores pertaining to surgery and comor bidity . This stratifies cardiac risk but is not designed to predict mortality (Table 21.11). ACS NSQIP score The American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) surgical risk score estimates the chance of a complication or death after surgery for more than a thousand di ff erent surgical procedures. It compares the patient’s

risk with an average person’s risk. It is a Web-based tool done preoperatively . The risk is calculated based on surgical procedure and 19 patient-specific preoper ative risk factors. Risk prediction

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Role of critical care and outreach services

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Reports from the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) show that the majority of postoperative deaths in the UK occur more than 5 days after surgery . Admission to a critical care unit allows for early treatment of complications and a level of care that is di ffi cult to deliver in the ward environment during this crucial period. Common complications include myocardial ischaemia, cardiac, respiratory or renal failure and sepsis. Perioperative MI is associated with a high mortality (15–25%). Critical care uses invasive cardiac monitoring and vasoactive drugs to help provide cardiac stability postopera tively to minimise ischaemia and guide fluid management to prevent cardiac failur e. Thomas H Lee , Professor of Medicine, Harvard Medical School, Professor of Health Policy and Management, Harvard School of Public Health, Boston, MA, USA. Friedrich Trendelenburg , 1844–1924, successively Professor of Surgery at Rostock (1875–1882), Bonn (1822–1895) and Leipzig, (1895–1911), Germany . The Trendelenburg position was first described in 1885. - - - - Postoperatively , 1.5% of patients develop lower respiratory tract infection after surgery , with a 30-day mortality of >20%. Respiratory failure, which is defined as PaO <8 /uni00A0 kPa in air, 2 PaO /F O (the ratio of arterial oxygen partial pressure to the 2 i 2 fraction of inspired oxygen) <40 /uni00A0 kPa or the inability to extubate a patient 48 hours after surgery , is by far the most significant of these and is associated with a mortality of 27–40%. Elective non-invasive ventilation, chest physiotherapy and incentive spirometry should be considered for patients at increased risk of respiratory complications. These are commonly delivered on the critical care unit (Figure 21.11). The high-risk surgical population accounts for 80% of postoperative deaths, but only about 15–30% of high-risk surgical patients are admitted to a critical care unit at any time following surgery . W ork by the National Emergency Laparotomy Audit in the UK is seeking to standardise treatment of this high-risk group with many recommendations, including admission to critical care where predicted mortality is >5%. In the last decade, the role of critical care has been expanded - to the concept of ‘critical care without walls’. The intensive care outreach services (ICORS) grew from a recognition that

Risk factors Risk of major cardiac complications (%) Number of factors History of ischaemic heart disease 0 = 0.4 History of compensated or prior heart failure 1 = 0.9 History of cerebrovascular disease 2 = 7.0 Diabetes mellitus 3+ = 11.0 Renal insuf /f_i ciency (creatinine >177 /uni00A0/uni03BC mol/L) High-risk surgery Figure 21.10 Robotic surgery

there were many patients in hospital who are at risk of being critically ill and that early identification of these patients using ‘early warning scores’ could allow for early intervention. The outreach team functions to bridge the gap between the critical care unit and ward.

Figure 21.11 A high-risk patient admitted to critical care postopera tively.

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Valvular heart disease

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While anaesthetic management is altered to achieve haemo dynamic stability in moderate valvular diseases, patients with severe aortic and mitral stenosis may benefit from valvuloplasty before elective non-cardiac surgery . Appropriate referral to an anaesthetist and cardiologist should be made. An echo is required in symptomatic patients with a new murmur. Patients with known significant valve pathology may benefit from a recent echo, especially if their clinical status has changed (standard intervals for surveillance echo can be guided by local cardiology policy). Patients with prosthetic valves are normally monitored with surveillance echo at intervals. In patients with mechanical heart valves, warfarin needs to be stopped preoperatively and bridging anticoagulation given to prevent valve thrombosis. Bridging options include unfraction ated heparin infusions or LMWHs and should be done under guidance agreed with haematology . Bridging therapy should continue postoperatively until the patient is re-established on warfarin with a therapeutic INR but must be balanced with factor Xa inhibitors are not licensed and should not be used in patients with mechanical valves. Valvular heart disease

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