

# 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 may 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).

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<sub>2</sub> <8 kPa or F<sub>O</sub> 0.4 or mechanical ventilation >48 hours Acute renal failure: urea >20 mmol/L or creatinine >260 μmol/L COPD, chronic obstructive pulmonary disease; F<sub>O</sub>, fraction of inspired oxygen; PaO<sub>2</sub>, arterial oxygen partial pressure. 2 Based on clinical criteria used by Shoemaker and colleagues, modified

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TABLE 21.7 Surgery-specific 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-specific 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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