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REVIEW ARTICLE

Preoperative anaesthesia assessment and patient preparation for surgery: update and a review

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ABSTRACT

Although anaesthetic and surgical procedures should be individualised for every patient, in practice many preoperative protocols and routines are used generally. The "Helsinki Declaration on Patient Safety in Anaesthesiology" establishes that the safety and quality of the perioperative care received by patients is the responsibility of anaesthesiologists. This declaration has been accepted by all the European Societies of Anaesthesiology and stipulates that all institutions providing perioperative anaesthesia care to patients should design protocols to guide perioperative patient management.

The present article aims to provide an evidenced-based review of preoperative assessment and preparation and to propose a protocol that can be adapted to the needs of each hospital and be incorporated into their routine practice. Emphasis is placed on the importance of correct preoperative evaluation in reducing morbidity and mortality in the surgical patient. This task can be aided by the use of preoperative questionnaires and the rational use of preoperative tests, which will also reduce unnecessary costs. Finally, the most widely accepted recommendations on preoperative fasting is discussed. The anaesthesiologist's legal responsibility, and patients' views in the preoperative process are also considered. A thorough clinical preoperative evaluation of the patient is more important than routine preoperative tests, which should be requested only when justified by clinical indications. Moreover, this practice eliminates unnecessary cost without compromising the safety and quality of care.

Introduction

Preoperative clinical evaluation is the clinical investigation that precedes anaesthesia for surgical or non-surgical procedures, and is the responsibility of the anaesthesiologist. The anaesthesiologist may be seeing the patient at the request of the surgeon or may be the primary care clinician assessing the patient prior to consideration of a surgical referral. The goal of the evaluation of the healthy patient is to detect unrecognized disease and factors that may increase the risk of surgery above baseline and to propose strategies to reduce it[1]. This assessment should rely on the rational use of information from the patient's medical records, clinical interview, physical examination, and some additional tests. Traditionally, a preoperative consultation with the anaesthesiologist has facilitated these goals. Nevertheless, the process of preoperative clinical evaluation has undergone major changes. The increasing number of day-case surgery procedures has affected the way in which the anaesthesiologist assesses patient's preoperatively[2].

The overall risk of surgery is low in healthy individuals, and the ability to stratify it with commonly performed evaluations is limited. Screening questionnaires can be helpful in the preoperative evaluation particularly to evaluate exercise capacity[3]. Important potential risk factors to discuss with the patient include functional capacity, alcohol use, smoking, illicit drug use, and medications. Obesity is not a risk factor for most major adverse postoperative outcomes in patients undergoing noncardiac surgery, with the exception of thromboembolic events. Clinicians should also inquire about personal or family history of complications from anaesthesia and screen for symptoms of obstructive sleep apnoea (OSA)[4].

Overuse and unexplained variations of tests for preoperative assessment have been extensively documented[5,6]. Although most institutions have established recommendations for the use of laboratory tests, information is scarce about the ability of such guidelines to modify and improve the selection of preoperative tests. It is important to investigate cost-effectiveness and efficiency while providing the best care[7]. This article is an update on recent management issues in preoperative assessment. Our aims are: to review and assess the evidence related to the health-care benefits of preoperative assessment; to offer a reference framework for the practice of preanaesthetic assessment; and to stimulate research.

Evidence is synthesized from different resources: Continuous review of journals, Electronic searching of databases (including Medline and Cochrane Library), Guidelines that adhere to the principles of evidence evaluation described, Published information regarding clinical trials, such as reports from the European Medicines Agency, as well as other sources of information produced by governmental and nongovernmental agencies such as the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) and the clinical experience and observations of authors.

Preoperative clinical evaluation

A. INTERVIEW

The preoperative interview is the anaesthesiologist's first introduction to a

patient. This is the most efficient and productive of the three basic techniques used in preoperative assessment[2]. The objectives of the interview in patients who are presumed to be basically healthy is to detect unrecognised disease that could increase the risk of surgery above the baseline[8]. The preoperative medical history should focus on the indication for surgical procedures, allergies, and undesirable side-effects to medications or other agents, known medical problems, surgical history, major trauma, and current medications. A focused review of issues pertinent to the planned anaesthetic procedures (cardiopulmonary function, homoeostatic status, possibility of pregnancy, personal or family history of anaesthetic problems, smoking and drinking habits, and functional status) has also been shown to be useful[2,9].

Screening questionnaires appear on many standard institutional preoperative evaluation forms. The purpose of these instruments is to provide an estimate of perioperative risk and to identify patients who need a preoperative clinician consultation (table 1)[2,10].

Table 1: Preoperative questionnaire for adults.[2]
Have you ever suffered from any of the following? (if yes, please give details)
Heart disease or any sort
Chest pain, palpitations, or blackouts
High blood pressure
Asthma, bronchitis, or other chest disease
Breathless on exertion at night
Diabetes or sugar in the urine
Kidney or urinary trouble
Convulsions or fits
Anaemia or other blood disorders
Bruising or bleeding problems
Blood clots in the legs or lungs
Jaundice (yellowness) Indigestion or heartburn
Any other serious illness
Do you smoke, or you have stopped recently? (if yes, how many a day?)
Do you drink alcohol? (if yes, how much a week?)
Do you have false, capped or crowned teeth?
Do you have a pacemaker or any implants?
Women
Could you be pregnant?
Are you on the pill or HRT?
What is your approximate weight?
What is your approximate height?
Are you taking any medicines or drugs?
Are you allergic to any drugs or materials?
Please list any previous operations or anaesthetics
Have you, or any member of your family, had any problems with anaesthetics?
Is there anything else that your anaesthetist or surgeon should know?

The questionnaire is not supposed to shorten the consultation but to reduce the time spent asking basic questions, allowing more time to discuss the actual problem and the operation (table 2)[2,7,9].

Table 2: Preoperative questionnaire for children[2].
1. Has your child had **good growth, development, and exercise tolerance**?
2. Has your child been **admitted to or frequently attended hospital**?
3. Has your child **attended a doctor in the past 4 weeks**?
4. Has your child had any of these symptoms in the past **4 weeks: high temperature, rash, cough, cold, sore throat**?
5. Has your child been in **contact with an infectious disease in the past 4 weeks**?
6. Does your child have any **heart problems**?
7. Has your child ever been **short of breath** while exercising or been **blue around the lips**?
8. Does your child's chest ever sound **wheezy and whistling**?
9. Does your child have any **kidney problems**?
10. Has your child ever been **jaundiced**?
11. Does your child **bruise easily**?
12. Has your child ever had any **convulsions or seizures**?
13. Does your child, or does anyone in the family, have **nerve or muscle problems**?
14. Have your child or family members ever had **problems with anaesthesia**?
15. Does your child have any other **medical conditions**?
16. **For female children**: has your child started her periods? If yes, what was the date of her last menstrual period?
17. Is there any chance that your child might be pregnant?

AGE: Much of the risk associated with older age is due to increasing numbers of comorbidities, which may include cognitive impairment, functional impairment, malnutrition, and frailty.[4,11] Older patients may benefit from preoperative assessments in those areas, but age should not be used as the sole criterion to guide preoperative testing or to withhold a surgical procedure. Aging is associated with a progressive loss of functional reserve in all organ systems. However, there is considerable individual variability in the onset and extent of these changes. The preoperative anaesthetic evaluation includes assessment of presence and stability of medical conditions and treatments, functional reserve of individual vital organs, and the patient as a whole including cognitive ability and risk factors for delirium.[12] Emphasis is placed on assessment of:

Frailty: Preoperative frailty is identified (table 3 and table 4).[13,14] Frailty influences patient and family discussions regarding surgical techniques, postoperative recovery strategies, and likely outcomes (e.g., mortality and morbidity including delirium or cognitive impairment, as well as longer hospital stay, discharge to a skilled nursing facility, and long-term functional decline).

Table 3: Frailty criteria[13].	
Shrinking (weight loss)	>10 pound weight loss during previous year
Weakness (grip strength)	Lowest 20th percentile measured by hand-held dynamometer
Exhaustion	Feeling "I can't get going" or "everything is an effort" 3 or more days per week
Activity level	Kilocalorie expenditure less than 20th percentile for gender
Walking speed	Lowest 20th percentile walking 15 feet at normal pace

Each criteria is scored with a 0 or a 1.

Intermediately frail was defined by meeting two or three criteria, while frail patients were defined by meeting four or five frailty criteria.

Table 4: Preoperative frailty assessment[14].

Frailty criteria	Assessment	Score	Points
Shrinkage	Ask the patient: Have you unintentionally lost ≥10 lbs in the past year? **Yes / No**	*If* ***Yes****, add 1 point*	
Weakness (grip strength)	1. Ask the patient to hold dynamometer in dominant hand with arms parallel to their body without squeezing arms against their body. 2. Adjust the handle to ensure that the middle phalanx rests on the inner handle. 3. Ask the patient to squeeze the handle and record. 4. Perform three trials, and obtain the average value. Record results below: Trial 1: _____ kg force Trial 2: _____ kg force Trial 3: _____ kg force **Average:** _____ kg force	Compare patient's average with the lowest 20th percentile by gender and BMI shown below: **Men** / **Women** **BMI** / **Kg force** / **BMI** / **Kg force** ≤24 / ≤29 / ≤23 / ≤17 24.1 to 26 / ≤30 / 23.1 to 26 / ≤17.3 26.1 to 28 / ≤31 / 26.1 to 29 / ≤18 >28 / ≤32 / >29 / ≤21 *Add 1 point* if the **average** falls within or below the above values	
Exhaustion	Ask the patient the following two questions: 1. How often in the last week did you feel that everything you did was an effort? _____ 2. How often in the last week did you feel that you could not get going? _____	**0** / **1** / **2** / **3** Rarely or none of the time (<1 day) / Some or a little of the time (1 to 2 days) / Moderate amount of the time (3 to 4 days) / Most of the time (>4 days) *Add 1 point* for a score of 2 or 3 for EITHER question	
Low physical activity	Ask the patient the following four questions: 1. Can you get out of bed or chair yourself? **Yes / No** 2. Can you dress and bathe yourself? **Yes / No**	*Add 1 point* for any **No** answer	

Table 4: Preoperative frailty assessment[14].

Frailty criteria	Assessment	Score				Points
	3.Can you make your own meals? **Yes / No** 4.Can you do your own shopping? **Yes / No**					
Slowness	1. Ask the patient to stand up and walk toward the tape on the ground. 2. Using a stopwatch, record the time it takes for the patient to walk 15 feet. Record results below: Trial: _____ seconds	Men		Women		
		Height	Time	Height	Time	
		≤173 cm	≥7 seconds	≤159 cm	≥7 seconds	
		>173 cm	≥6 seconds	>159 cm	≥6 seconds	
		Add 1 point if the trial time falls higher than the above values				
Frailty score:						

Total the **number of points for each criterion** (the total should be 0 to 5) to determine the frailty score.

- 0 to 1: Not frail
- 2 to 3: Intermediate (pre-frail)
- 4 to 5: Frail

If the patient is in the intermediate frail or frail categories, please notify the surgeon.

BMI: body mass index.

•**Cognitive function:** The ASA Brain Health Initiative guidelines suggest that baseline cognition should be evaluated in patients older than 65 years, particularly those with risk factors for pre-existing cognitive impairment[15]. Older patients should be informed of risks for postoperative neurocognitive disorder (e.g., confusion, inattention, and/or memory problems). However, these effects of anaesthesia and surgery are usually temporary.

•**Current medications**: Obtaining an accurate prescription and over-the-counter medication history is important to identify drugs potentially relevant for anaesthetic care, and affords an opportunity for reconciliation of the patient's medication schedule[16].

•**Assessment of institutionalized patients:** Challenges include dementia and the likely presence of multiple comorbidities and/or frailty[12].

•**Perioperative cardiac risk:** There is more robust literature supporting age as an independent risk factor for postoperative pulmonary complications. In a systematic review, age was one of the most important patient-related predictors of pulmonary risk, even after adjusting for common age-related comorbidities[17].

Exercise: All patients should be asked about their exercise capacity as part of the preoperative evaluation. The American College of Cardiology/American Heart Association guideline on preoperative cardiac evaluation recommends that patients with good exercise capacity (at least 4 metabolic equivalents [METs]) do not require preoperative testing, regardless of the risk of the planned procedure.

However, a more formal assessment of functional capacity may more reliably predict surgical risk[18,19], and we favour the use of a

standardized assessment and scoring system such as the Duke Activity Status Index (DASI) rather than relying upon subjective self-reported functional capacity[5]. In the largest trial to formally evaluate the impact of functional capacity on surgical outcomes, investigators in the Measurement of Exercise Tolerance before Surgery (METS) trial compared scores on the standardized DASI questionnaire with subjective self-reported functional capacity[19]. The DASI instrument contains 12 questions related to activities of daily living as well as more vigorous activity[6,18]. In an adjusted analysis, subjectively reported functional capacity did not predict death or myocardial infarction in the first 30 days after surgery, whereas DASI scores were significantly associated with these outcomes. In general, healthy patients with moderate (or better) functional capacity have a low risk for major postoperative complications (table 5).

Table 5: Duke Activity Status Index questionnaire to determine functional capacity[5].

Activity	Weight
Can you.	
1. Take care of yourself that is, eating, dressing, bathing or using the toilet?	2.75
2. Walk indoors, such as around your house?	1.75
3. Walk a block or 2 on level ground?	2.75
4. Climb a flight of stairs or walk up a hill?	5.50
5. Run a short distance?	8.00
6. Do light work around the house like dusting or washing dishes?	2.70
7. Do moderate work around the house like vacuuming, sweeping floors, or carrying in groceries?	3.50
8. Do heavy work around the house like scrubbing floors, or lifting or moving heavy furniture?	8.00
9. Do yard work like raking leaves, weeding or pushing a power mower?	4.50
10. Have sexual relations?	5.25
11. Participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?	6.00
12. Participate in strenuous sports like swimming, singles tennis, football, basketball or skiing?	7.50

- Total DASI score: _____
- METs [(DASI score × 0.43) + 9.6] / 3.5: _____

The higher the DASI score, the more physically active the patient is. Patients who can achieve <4 METs have poor functional capacity, 4 to 10 METs suggest moderate functional capacity, and >10 METs suggest excellent functional capacity. The DASI questionnaire is not designed to assess very high levels of physical activity. The maximum DASI score is 58.2, which would be the equivalent of 9.89 METs.
DASI: Duke Activity status index; METs: metabolic equivalents.

Medication use: Anaesthesiologist should obtain a history of medication use for all patients before surgery and should specifically inquire about over-the-counter, complementary, herbal, and alternative medications. Aspirin, ibuprofen, and other nonsteroidal anti-inflammatory drugs (NSAIDs) are associated with an increased risk of perioperative bleeding. Perioperative medication management is not presented in this article.

Obesity: Contrary to popular belief, in noncardiac surgery, obesity is not a risk factor

for most major adverse postoperative outcomes, with the exception of pulmonary embolism. None of the published and widely disseminated cardiac risk indices for noncardiac surgery include obesity as a risk factor for postoperative cardiac complications. However, in cardiac surgery, some studies have shown higher complication rates for patients with obesity, including increased hospital stay, wound infections, prolonged mechanical ventilation and atrial arrhythmias[21-23].

Obstructive sleep apnoea: given the increased risks of perioperative morbidity and the potential for altered anaesthetic management, it is reasonable to screen patients for obstructive sleep apnoea (OSA) before surgery with one of several validated screening instruments, such as the STOP-Bang questionnaire (table 6)[24,25].

Table 6: STOP-Bang questionnaire[24,25].		
Yes	No	**Snoring?** Do you **snore loudly** (loud enough to be heard through closed doors, or your bed partner elbows you for snoring at night)?
Yes	No	**Tired?** Do you often feel **tired, fatigued, or sleepy** during the daytime (such as falling asleep during driving)?
Yes	No	**Observed?** Has anyone **observed** you **stop breathing** or **choking/gasping** during your sleep?
Yes	No	**Pressure?** Do you have or are you being treated for **high blood pressure**?
Yes	No	**Body mass index more than 35 kg/m^2?**
Yes	No	**Age older than 50 years old?**
Yes	No	**Neck size large (measured around Adam's apple)?** Is your shirt collar 16 inches or larger?
Yes	No	**Gender (biologic sex) = Male?**
Scoring criteria:		
Low risk of OSA: Yes to 0 to 2 questions		
Intermediate risk of OSA: Yes to 3 to 4 questions		
High risk of OSA: Yes to 5 to 8 questions		

OSA: obstructive sleep apnoea.

Obstructive Sleep Apnoea increases the risk for postoperative medical complications including hypoxemia, respiratory failure, unplanned reintubation, and intensive care unit (ICU) transfer[26]. Most patients with OSA are undiagnosed. The prevalence of previously undetected OSA is particularly high in patients preparing for bariatric surgery. The ASA recommends screening for OSA before noncardiac surgery[27].

Alcohol: Patients who misuse alcohol on a regular basis have an increased risk for postoperative complications. Pending further study, it is reasonable to screen all patients for alcohol misuse before elective major surgery. While the benefit of directed alcohol cessation programs before surgery is not well-established in the literature, there is little apparent risk to such a strategy. The preoperative period also serves as an

opportunity to identify patients who misuse alcohol and are candidates for intervention as part of primary care follow-up after surgery[28].

Smoking: Evaluating tobacco use and offering strategies to quit smoking may reduce postoperative morbidity and mortality, as patients who smoke have an increased risk for postoperative complications. Smoking cessation prior to surgery may reduce the risk of postoperative complications, and longer periods of smoking cessation are even more effective[29]. Those who smoke should be encouraged to quit preoperatively.

B. PHYSICAL EXAMINATION

A complete physical examination in presumed healthy individuals includes: weight and height; main vital signs—blood pressure, pulse (rate and regularity), and respiratory rate; cardiac and pulmonary examination; anatomical conditions required for specific anaesthetic procedures, such as intubation (airway examination), regional anaesthesia, venous access, etc.; and other particular examinations thought to be of use[2].

C. ROUTINE PREOPERATIVE TESTS

Electrocardiogram

ECGs have a low likelihood of changing perioperative management in the absence of known cardiac disease. The prevalence of abnormal ECGs increases with age[30]. Important ECG abnormalities in patients younger than 45 years with no known cardiac disease are very infrequent.

The 2014 American College of Cardiology/American Heart Association (ACC/AHA) Guidelines on Perioperative Cardiovascular Evaluation state that ECGs are not useful in asymptomatic patients undergoing low-risk procedures[31]. Similarly, the European Society of Cardiology 2014 preoperative guidelines do not recommend obtaining ECGs[32]. The 2014 ACC/AHA guidelines recommend a preoperative resting 12-lead ECG for patients with known coronary artery disease, significant arrhythmia, peripheral arterial disease, cerebrovascular disease, or other significant structural heart disease, except for those undergoing low-risk surgery (risk of major adverse cardiac event <1 percent)[31]. A preoperative resting ECG can also be considered for asymptomatic patients undergoing surgery with elevated risk (risk of major adverse cardiac event ≥1 percent). Preoperative evaluation of patients with known cardiovascular disease or cardiovascular disease risk factors is discussed in detail elsewhere. The 2009 AHA Scientific Advisory on Cardiovascular Evaluation and Management of Severely Obese Patients Undergoing Surgery states that it is reasonable to obtain a 12-lead ECG prior to surgery in patients with class III obesity (body mass index ≥40 kg/m^2) with at least one risk factor for coronary heart disease (diabetes, smoking, hypertension, or hyperlipidaemia) or poor exercise tolerance[33].

Chest radiography

Several systematic reviews and independent advisory organizations in the United States and Europe recommend against routine chest radiography in healthy patients[34,35]. Preoperative chest radiographs add little to the clinical evaluation in identifying patients at risk for perioperative complications[2,36]. Abnormal findings on chest radiograph occur frequently and are more prevalent in older patients[37]. There is little evidence to support the use of preoperative chest radiographs, regardless of age, unless there is known or

suspected cardiopulmonary disease from the history or physical examination.

Routine preoperative laboratory tests

Routine preoperative laboratory tests have not been shown to improve patient outcomes among healthy patients undergoing surgery. We do not suggest routinely testing for serum electrolytes, blood glucose, liver function, haemostasis, or urinalysis in the healthy preoperative patient. Routine laboratory testing in healthy patients has poor predictive value, potentially leading to false-positive test results and/or increased medico legal risk for not following up on abnormal test results[2,20].

While preoperative laboratory testing is not routinely indicated, selective testing is appropriate in specific circumstances, including patients with known underlying diseases or risk factors that would affect operative management or increase risk, and specific high-risk surgical procedures[2,38]. Specific laboratory studies commonly ordered for preoperative evaluation include a complete blood count, electrolytes, renal function, blood glucose, liver function studies, haemostasis evaluation, and urinalysis. These tests are discussed below with indications for their use in specific populations and surgeries.

●**Haemoglobin/haematocrit**: In develop countries, a baseline haemoglobin measurement is suggested for all patients 65 years of age or older who are undergoing major surgery and for any patient undergoing major surgery that is expected to result in significant blood loss. By contrast, haemoglobin measurement is not necessary for those undergoing minor surgery unless the history suggests severe anaemia or worsening of chronic, stable anaemia[2].

Preoperative anaemia is common and is associated with poor clinical outcome in surgical patients. Patient blood management (PBM) programs include different evidence-based interventions addressed to maintain patients' own blood mass and avoid unnecessary transfusions. PBM strategies are organized in three main pillars: management of anaemia with early detection and use of erythropoiesis-stimulating agents; minimizing iatrogenic blood loss; and optimization of patient-specific physiological tolerance to anaemia with a restrictive transfusion strategy[39].

●**White blood cell count and platelets:** The frequency of significant unsuspected white blood cell or platelet abnormalities is low[20]. It is reasonable to measure platelet count when neuraxial anaesthesia (spinal or epidural) is planned. Unlike the haemoglobin concentration, however, there is little rationale to support baseline testing of either. Nevertheless, obtaining a complete blood count, including white count and platelet measurement, can be recommended if the cost is not substantially greater than the cost of a haemoglobin concentration alone. There may be some costs incurred due to follow-up of false-positive results; however, with respect to platelet counts, these costs do not appear to be substantial[20,40].

●**Electrolytes:** In healthy adults, the frequency of unexpected electrolyte abnormalities is low (0.6 percent in one report)[41]. While preoperative hypernatremia is associated with an increase in perioperative 30-day morbidity and mortality[42], the relationship between most electrolyte derangements and operative morbidity is not clear. Furthermore, clinicians can predict most abnormalities based on history (for example,

current use of a diuretic, ACE inhibitor, or ARB, or known chronic kidney disease).

●**Blood glucose:** Unexpected abnormal blood glucose results do not often influence perioperative management. Also, the frequency of glucose abnormalities increases with age; almost 25 percent of patients over age 60 had an abnormal value in one report[43]. Most controlled studies have not found a relationship between operative risk and diabetes[43], except in patients undergoing vascular surgery or coronary artery bypass grafting[44]. While the revised cardiac risk index identified diabetes as a risk factor for postoperative cardiac complications, only patients with insulin-treated diabetes were at risk[45]. There is limited evidence that asymptomatic hyperglycaemia, in a patient not previously known to have diabetes, increases surgical risk. The rate of asymptomatic hyperglycaemia in unselected surgical patients is low; in one report, the incidence was only 1.2 percent[46]. A systematic review examined the relationship between preoperative blood glucose and A1c values in patients without known diabetes and postoperative complications after noncardiac surgery[44]. Among 22 eligible studies, no high-quality tests supported a role for routine preoperative screening in otherwise healthy patients. Exceptions were an increased risk of cardiac complications after vascular surgery and an increased risk for infectious complications after orthopaedic surgery, among patients with abnormal preoperative blood glucose or A1c.

●**Kidney function:** The prevalence of an elevated creatinine among asymptomatic patients with no history of kidney disease is only 0.2 percent. However, the prevalence increases with age. In one study, for example, the prevalence among unselected patients aged 46 to 60 was 9.8 percent[43]. In the revised cardiac risk index, a serum creatinine >2.0 mg/dL (177 micromole/L) was one of six independent factors that predicted postoperative cardiac complications. Chronic kidney disease is also an independent risk factor for postoperative pulmonary complications and a major predictor of postoperative mortality[47]. Impaired kidney function necessitates dosage adjustment of some medications that may be used perioperatively (e.g., muscle relaxants).

●**Liver function tests:** Unexpected liver enzyme abnormalities are uncommon, occurring in only 0.3 percent of patients in one series[48]. In a pooled data analysis, only 0.1 percent of all routine preoperative liver function tests changed preoperative management[2]. Severe liver function test abnormalities among patients with cirrhosis or acute liver disease are associated with increased surgical morbidity and mortality, but no data suggest that mild abnormalities among patients with no known liver disease have a similar impact[49]. Clinically significant liver disease would most likely be suspected on the basis of the history and physical examination.

●**Routine preoperative tests of haemostasis:** If the evaluation suggests the presence of a bleeding disorder, appropriate screening tests should be performed, including prothrombin time (PT), activated partial thromboplastin time (aPTT), and platelet count[50]. Unexpected significant abnormalities of the PT or PTT are uncommon[40]. Inherited coagulation defects are quite rare. For example, the incidence of haemophilia A and B among men is 1:5000

and 1:30,000, respectively[51]. Nearly all of these cases would be evident based on clinical presentation prior to the preoperative medical evaluation. In addition, the relationship between an abnormal result and the risk of perioperative haemorrhage is not well-defined but appears to be quite low, particularly in those who are thought to have a low risk of haemorrhage on the basis of history and physical examination[52]. Even among neurosurgical patients, for whom a small amount of unanticipated bleeding could cause substantial morbidity, the medical history is the most useful screening test for bleeding diathesis.

●**Urinalysis**: The theoretical reason to obtain a preoperative urinalysis is detection of unsuspected urinary tract infection. Urinary tract infections have the potential to cause bacteraemia and postsurgical wound infections, particularly with prosthetic surgery[53]. Patients with positive urinalysis and urine culture are generally treated with antibiotics and proceed with surgery without delay[54]. However, it is unclear whether a positive preoperative urinalysis and culture with subsequent antibiotic treatment prevent postsurgical infection. One study found no difference in wound infection between patients with normal and abnormal urinalysis[55]. Another study found that patients with asymptomatic urinary tract infection detected by urinalysis had an increased risk of wound infection postoperatively, despite treatment[56].

●**Pregnancy testing:** Pregnancy substantially changes perioperative management. Anaesthetic technique differs in pregnancy, and there may be risks to the foetus if a pregnancy goes undetected before surgery and anaesthesia. Guidelines in the United Kingdom recommend always asking about the possibility of pregnancy before surgery and, if pregnancy is possible after history-taking, offering a pregnancy test[57,58]. The ASA recommends that clinicians offer pregnancy testing for females of childbearing age if the results would alter management[34]. Many institutions require pregnancy testing for all reproductive age females before surgery. There is low risk to this approach; false-positives are rare, testing is inexpensive, and the results return rapidly.

●**Coronavirus disease 2019 screening and testing:** Patients scheduled for elective surgery should be screened for exposure to and symptoms of coronavirus disease 2019 (COVID-19). Symptomatic patients should be referred for additional clinical assessment. Protocols for routine preoperative testing vary by institution and geographic region[59], although a 2021 joint statement published by the ASA and the Anaesthesia Patient Safety Foundation recommends that all patients scheduled for elective surgery should undergo preoperative polymerase chain reaction (PCR) testing for COVID-19[60]. Ideally, this testing should be performed no longer than 72 hours before surgery and applies to all asymptomatic patients regardless of vaccination status.

Rationale for preoperative fasting in adults and children

Restricted intake of food and oral fluid before general anaesthesia has for a long time been judged vital, to reduce the risk of regurgitation of the gastric contents. However, preoperative fasting can impair nutrition and hydration. Anaesthesiologists

concerned with the well-being, hydration, comfort, and safety of their patient try to establish safe periods of preoperative fasting without unnecessary starvation. Patients are asked to fast before anaesthesia to reduce the risk of aspiration and the severity of pulmonary injury in the event of aspiration. Pulmonary aspiration is a rare event but carries significant morbidity and mortality[2,61].

Fasting guidelines

For most patients who undergo elective surgery with general anaesthesia, regional anaesthesia, or monitored anaesthesia care, we use preoperative fasting guidelines in general and special patient population. The following recommendations are mainly based on consensus opinion and known gastric physiology instead of high-quality studies showing a clinical benefit. Patients with risk factors for delayed gastric emptying or increased risk of aspiration may require longer fasting intervals.

•**Clear liquids**: We suggest fasting for two hours (Grade 2C). Clear liquids include water, juices without pulp, coffee or tea without milk, and carbohydrate drinks[62].

•**Solid food, non-clear liquids, and nonhuman milk**: We suggest fasting for six hours, and eight hours for a fatty meal or meat (Grade 2C)[63].

•**Chewing gum**: We suggest not chewing gum two hours prior to surgery, but we do not delay surgery for patients who continue chewing gum until surgery[64,65].

•**Medications**: Take with a clear liquid up to two hours prior to surgery. For medications that must be taken orally within two hours of anaesthesia, take with a sip of water.

•**Special patient populations**

- Standard preoperative fasting guidelines are appropriate for patients with obesity and pregnant patients who are not in labour[66,67].

- Patients with diabetes who have delayed gastric emptying or gastroparesis may require longer fasting times[68].

- For patients who are receiving enteral tube feeds, the decision to stop feeds represents a balance between the need for maximal nutritional support versus the risk of aspiration[69,70].

- For patients undergoing abdominal surgery and those with a gastric tube who are not intubated or who have an uncuffed tracheostomy tube in place, we suggest stopping tube feeds eight hours prior to surgery (Grade 2C).

- For patients with confirmed postpyloric feeding tubes, we continue tube feeds until the patient is called for surgery.

Fasting in enhanced recovery after surgery protocols

Major surgery is a form of stress that typically results in insulin resistance[71], which can cause hyperglycaemia and associated postoperative complications. Enhanced recovery after surgery (ERAS) protocols that have been developed for various surgical procedures aim to reduce surgical stress and insulin resistance. They typically minimize the perioperative fasting period and suggest preoperative oral hydration up until two hours prior to surgery, and many ERAS protocols include as much as 500 mL of clear liquid or oral carbohydrate drink two to three hours prior to surgery. Some studies have found that administration of a preoperative carbohydrate

drink or a preoperative glucose infusion reduced the degree of insulin resistance (and resultant hyperglycaemia) that typically occurs after major surgery[72,73]; improved other outcomes (e.g., preserved muscle mass and earlier return of bowel function after colorectal surgery); and were associated with small reductions in hospital length of stay[74]. However, the benefits of preoperative carbohydrate administration in isolation, separate from other components of ERAS protocols, have not been confirmed. The available literature suggests that consumption of carbohydrate drinks as part of ERAS does not affect gastric residual volume or stomach pH[75-77]. As an example, in one study of 250 patients who were randomly assigned to drink 400 mL of a carbohydrate drink or a placebo drink, or to fast, before elective abdominal surgery, mean gastric residual volume and stomach pH after induction of anaesthesia were similar among the groups[75]. Similarly, in a randomized trial including 64 patients who had elective benign gynaecologic surgery, gastric volume assessed by ultrasound was similar in patients who fasted from midnight and those who ingested carbohydrate drinks until two hours prior to surgery[78]. Benefits of oral hydration with carbohydrate drinks as part of ERAS protocols have not been determined.

Patient's perspective on preoperative medical evaluation

The anaesthesiologist's preoperative consultation with the patient is important to enhance trust and confidence. The patient should know the anaesthesiologist's name and status. If the anaesthesiologist is still in training, the patient will want to know that his or her levels of competence and experience are appropriate, and that a senior specialist will be at hand[2,7]. The preoperative anaesthetic clinic is the place and time to assess the patient's fitness for surgery as well as to discuss the most appropriate anaesthetic technique in the light of the patient's preferences, clinical state, the operation itself, and the anaesthesiologist's preferences and special skills[79]. This is also the time to help the patient raise any doubts and questions about aspects of anaesthetic care, and to obtain the patient's explicit consent to what is agreed. Discussion between anaesthesiologist and patient should include how the patient will get to the theatre, if there is a choice; what will be experienced in the recovery room, or in ICU, if that is planned; what time the operation is scheduled, with a prompt explanation if the time slips; whether a blood transfusion is likely to be given; how postoperative and post discharge pain will be managed and what choices there might be. If the patient is to wake up with an epidural catheter or a patient -controlled analgesia machine, intravenous line, oxygen mask, etc. those too must be explained[2]. Patients prefer to be seen preoperatively by the same anaesthesiologist who will later anaesthetise them[2,79]. Most anaesthesiologists agree, and this practice is deemed to be a marker of high-quality anaesthesia by the UK Association of Anaesthesiologists[80,81]. Finally, a postoperative visit, however brief, by the anaesthesiologist, completes the patient's perception of good quality of care.

Legal aspects in preoperative clinical evaluation

As far as medical responsibility is concerned, no specific rules can be formulated, neither for

anaesthesiologists or any other medical specialists, nor for the different medical acts. In October, 1987, the US Congress approved the duties of preanaesthetic care (last modified in October, 1993), stating that the anaesthesiologist has a responsibility to determine the medical condition of the patient, to develop a plan of anaesthetic care, and to inform the patient or guardian of this plan. These principles apply to all patients who are going to undergo anaesthesia or a monitored anaesthetic procedure and can only be modified in special circumstances, such as an extreme emergency[82]. The specifications state that preoperative screening tests are usually useful, but no systematic tests are required for the pre-anaesthetic assessment[2,82]. Anaesthesiologists, the Anaesthetic Department, and medical institutions should develop scientifically based guidelines to define the tests to be used preoperatively. The probable contribution of each test to the final result of surgery should be assessed individually. Every anaesthesiologist should, additionally, ask for any specific tests, the results of which could affect, in his or her opinion, the decisions to take, the risks involved, and the ways to control the anaesthesia and surgery in every individual case.

In France, a 1974 government circular established the preoperative anaesthetic consultation as compulsory; the assessment must be summarised in a preoperative report, and done far enough in advance to allow time for all the necessary complementary tests[83].

In other countries, there are no similarly defined regulations. In Spain, failure to do adequate preoperative tests is judged, in view of recent court cases, to be serious negligence, unless surgery is urgent and vital. Biochemical and haematological tests, radiography, and an electrocardiogram have been judged, in legal cases, to be necessary to show the true condition of the patient and to eliminate, or at least diminish, the likelihood of treatment failure or death[84]. However, as previously mentioned, there is much evidence that routine preoperative testing is done, not for clinical reasons, but to prevent possible legal claims by the patients.

Conclusions

The overall risk of surgery is low in healthy individuals, and the ability to stratify risk with commonly performed evaluations is limited. Screening questionnaires can be helpful in the preoperative evaluation, particularly to evaluate exercise capacity. Important potential risk factors to discuss with the patient include functional capacity, alcohol use, smoking, illicit drug use, and medications. Obesity is not a risk factor for most major adverse postoperative outcomes in patients undergoing noncardiac surgery, with the exception of thromboembolic events. Clinicians should also inquire about personal or family history of complications from anesthesia and screen for symptoms of OSA.

Routine preoperative laboratory tests have not been shown to improve patient outcomes among healthy patients undergoing surgery. We do not suggest routinely testing for serum electrolytes, blood glucose, liver function, hemostasis, or urinalysis in the healthy preoperative patient. Routine laboratory testing in healthy patients has poor predictive value, potentially leading to false-positive test results and/or increased medicolegal risk for not following up on abnormal test results.

- Preoperative haemoglobin measurement: We suggest preoperative haemoglobin measurement in all patients ≥65 years of age undergoing major surgery, any patient undergoing surgery that is expected to result in significant blood loss and any patient undergoing surgery (including minor surgery) if the clinical history suggests severe anemia or worsening of chronic, stable anaemia.

- Preoperative serum creatinine: We suggest obtaining a serum creatinine concentration in patients >50 years old undergoing intermediate or high-risk surgery, any patient suspected of having kidney disease, if hypotension is likely during surgery and if nephrotoxic medications will be used.

- Preoperative electrolytes: We do not routinely check preoperative electrolytes unless there is a clinical history that increases the likelihood of an abnormality, such as patients who take diuretics, angiotensin-converting enzyme inhibitors, or angiotensin receptor blockers.

- Preoperative pregnancy testing: We suggest preoperative pregnancy testing in all females of reproductive potential rather than use of history-taking alone to determine the potential for pregnancy.

- Preoperative COVID-19 testing: Patients scheduled for elective surgery should be screened for exposure to and symptoms of coronavirus disease 2019 (COVID-19).

- ECG is not indicated for asymptomatic patients undergoing low-risk surgery. According to the 2014 American College of Cardiology/American Heart Association (ACC/AHA) guidelines, a resting 12-lead ECG should be part of the preoperative evaluation in patients with known coronary artery disease, significant arrhythmia, peripheral arterial disease, cerebrovascular disease, or other significant structural heart disease undergoing any other than low-risk surgical procedures.

- Preoperative chest radiography is not indicated in the absence of active, symptomatic cardiopulmonary disease, even before high-risk noncardiothoracic surgery, in the absence of active cardiopulmonary disease or symptoms.

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