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PERIOPERATIVE MEDICINE IN A NUTSHELL

Perioperative Functional Assessment

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Abstract

Perioperative functional assessment is used to inform perioperative risk estimation and to target interventions such as prehabilitation, particularly in higher-risk cohorts. There are a variety of measures used and practice is variable. UK national guidance recommends cardiopulmonary exercise testing (CPET) or alternative objective measures when reduced functional capacity is identified on screening.

Key words: perioperative care; physical fitness; exercise tolerance; risk assessment; CPET

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Introduction

Functional capacity, or physical fitness, describes the maximum (or almost maximum) activity an individual can perform. In perioperative medicine, assessment of functional capacity can assist in estimating perioperative risk and determining an individual patient's 'fitness for surgery'. UK national guidance recommends that patients undergo validated risk stratification tools to supplement clinical assessment (National Institute for Health and Care Excellence, 2020). Quantification of functional capacity is an important part of this process, alongside other clinically important variables such as age, medical and surgical history, and social circumstances.

This is particularly valuable for patient cohorts at higher inherent perioperative risk, such as elderly or comorbid patients, or those undergoing major surgery. In these groups, an accurate assessment of functional capacity may significantly influence clinical decision-making. This can also assist in tailoring the perioperative experience, including informing shared decision-making and guiding clinical care such as postoperative destination planning. Additionally, there is increasing interest in 'prehabilitation'. Patients with low functional capacity may undergo an individualised exercise programme supporting them prepare for surgery (Centre for Perioperative Care, 2021). For urgent or emergency surgery, detailed assessment of functional capacity may not be possible.

Metabolic equivalents of tasks (METs) are used to quantify patients' functional capacity. One MET is equivalent to oxygen expenditure at rest (3.5 mL/kg/min). Other commonly calculated measures include Oxygen intake (VO_2) peak (peak oxygen intake at point of fatigue) and anaerobic threshold (VO_2 when anaerobic respiration commences).

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Cardiopulmonary Exercise Testing (CPET)

The gold standard assessment of functional capacity remains cardiopulmonary exercise testing (CPET), which is recommended by UK national guidance when reduced functional capacity is identified on preoperative screening (Centre for Perioperative Care, 2021). Patients complete incremental exercise while breathing through a mouthpiece. VO_2, carbon dioxide production (VCO_2), end-tidal gases, oxygen saturations, continuous 12-lead electrocardiogram (ECG), and non-invasive blood pressure are recorded. From these, clinically useful measures are calculated.

Some studies have linked poor performance during CPET with increased perioperative mortality (Stubbs et al, 2020). Features of high-risk CPET studies include low anaerobic threshold (<11 mL/kg/min), low VO_2 peak (<14 mL/kg/min), raised ventilatory equivalents for CO_2 (VE/VCO_2 >34), reduced oxygen pulse, reduced heart rate response or ECG abnormalities during exercise. A major limitation of CPET is resource—assessment requires time and specialised equipment. Patients must be able to undertake the modality of exercise chosen. Critics also argue that CPET fails to provide additional utility to alternative measures of functional capacity.

Alternative Objective Measures

Alternative tests to quantify functional capacity include the 6-minute walk test (6MWT), which involves walking up and down a 30 m flat corridor, the 1-minute sit-to-stand test (1-MSTST), which involves standing from sitting repeatedly, and the incremental shuttle walk test (ISWT), which consists of walking between two cones 10 m apart during intervals of decreasing time. After exertion, variables are recorded including heart rate, oxygen saturation, and Borg dyspnoea scale (a subjective measure of breathlessness). These tests are more convenient, less complex, and less expensive than CPET. Studies have validated these tests as measures of exercise capacity and tools for estimating perioperative risk (Bohannon and Crouch, 2019; Sinclair et al, 2012). UK national guidance recommends the use of these measures, particularly where CPET is not available or impractical (Centre for Perioperative Care, 2021).

Patient Reported Measures

Many UK centres use subjective patient-reported assessments of functional capacity such as the ability to walk on the flat, climb stairs or independently undertake activities of daily living (ADLs). Information obtained from patient history is easy to collect but markedly subjective. The Duke Activity Status Index (DASI) is a 12-point questionnaire scoring a variety of ADLs and exercise modalities, used to estimate VO_2 peak and METs (Hlatky et al, 1989). Studies have validated DASI for use in the assessment of functional capacity and UK national guidance recommends its use as a screening tool (Centre for Perioperative Care, 2021). Critics suggest that the VO_2 peak estimated by DASI has a poor correlation with CPET-

derived values. However, it is recommended that if reduced functional capacity is identified patients should undergo assessment via an objective measure.

Conclusion

Assessment of functional capacity is important in preoperative assessment and risk management, particularly for specific patient cohorts. CPET is the gold standard but is expensive and time-consuming. Other supervised tests of physical activity may also be used. Most centres use easy but subjective measures from patient history. Preoperative exercise interventions may enhance physical fitness.

Availability of Data and Materials

Not applicable.

Author Contributions

SRW and DH designed the research. SRW drafted the initial manuscript. Both authors contributed to the important editorial changes of important content in the manuscript. Both authors read and approved the final manuscript. Both authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Not applicable.

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Conflict of Interest

The authors declare no conflict of interest.

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