

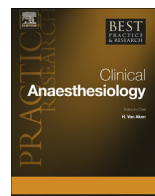


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## Best Practice & Research Clinical Anaesthesiology

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### Preparing the patient for surgery to improve outcomes



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#### Keywords:

prehabilitation  
functional capacity

The time between contemplation of surgery and the procedure offers a window of opportunity to optimize patients' nutritional, functional and psychological state prior to surgery. Traditionally,

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<http://dx.doi.org/10.1016/j.bpa.2016.04.002>

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cardiopulmonary exercise testing  
surgical outcome

preoperative pathways have focused on the underlying disease process and 'fitness for surgery' with physical pre-assessment and risk counselling late in the pathway when little time is available to intervene. With an increasingly elderly and co-morbid surgical population, early physiological assessment and multidisciplinary collaborative decision-making is increasingly important. Multimodal prehabilitation programmes may improve surgical outcome, facilitating rapid recovery from surgery and limiting post-operative functional dependence. Patient education and engagement is important if compliance with behavioural change is to be achieved and maintained. To date, there has been evidence supporting preoperative exercise training, smoking cessation, reduction in alcohol intake, anaemia management and psychosocial support. Further research is needed to identify the most effective elements of these complex preoperative interventions, as well as their optimum timing and duration.

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## The surgical population and perioperative outcomes

The elective surgical population is expanding internationally as the global volume of major surgical procedures continues to increase year by year. It is estimated that >300 million major procedures are now performed annually [1]. As life expectancy continues to rise, an increasing number of these patients are elderly with multiple co-morbidities. Such patients represent a challenge to the perioperative team, and it is increasingly recognized that they require multidisciplinary input and collaborative decision-making to ensure an optimum surgical outcome [2].

Despite advances in surgical and anaesthetic management, a proportion of surgical patients continue to have poor outcomes with recent cohort studies reporting up to 3–4% elective surgical mortality in European [3] and North American [4] patient populations. Post-operative complications occur more frequently, for example, in around 30% of patients undergoing major intra-abdominal surgery [5]. Even in the absence of significant complications, surgical patients experience a 40% decrease in fitness and functional capacity post-operatively [6]. Furthermore, they suffer from a number of debilitating symptoms in the weeks following discharge from hospital including profound fatigue, disturbed sleep, low mood, anxiety and reduced cognitive function [6,7]. These symptoms have negative impacts on patients' ability to perform their activities of daily living, consequently impairing their post-operative quality of life [8]. For example, 3 months after radical prostatectomy, only 30% of patients returned to baseline levels of physical function and energy [8].

## Preoperative identification of high-risk patients

Accurate preoperative risk stratification is necessary to identify patients at a risk of a poor outcome who may benefit from preoperative intervention. Patients' post-operative functional impairment is multifactorial in origin. Risk factors for a poor outcome include both fixed factors (e.g., age and chronic co-morbidities) and potentially modifiable risk factors (e.g., physical activity levels and smoking). Increasing evidence suggests that preoperative functional capacity is an effective predictor of post-operative outcome [9,10]. Functional capacity reflects underlying physiological reserve, thus providing insight into the patient's ability to endure the physiological stress of major surgery and the harmful effects of prolonged postsurgical bed rest and poor perioperative nutritional intake. Functional capacity can be measured objectively before surgery using cardiopulmonary exercise testing (CPET). Both anaerobic threshold (AT) and peak oxygen uptake ( $\dot{V}O_2$  peak) (objective measures of exercise capacity) have consistently been associated with post-operative morbidity, mortality and functional

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