

Integrating Prehabilitation in the Preoperative Clinic: A Paradigm Shift in Perioperative Care

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GLOSSARY

6MWD = 6-minute walking distance; **6MWT** = 6-minute walk test; **aPG-SGA** = abridged scored Patient-Generated Subjective Global Assessment; **BNP** = B-type natriuretic peptide; **COVID-19** = coronavirus disease 2019; **CPET** = cardiopulmonary exercise test; **DASI** = Duke Activity Status Index; **ERAS** = Enhanced Recovery After Surgery; **HADS** = Hospital Anxiety and Depression Scale questionnaire (Anxiety and Depression subscale); **Hb** = hemoglobin; **HGS** = handgrip strength; **PG-SGA** = Patient-Generated Subjective Global Assessment questionnaire; **Prehab** = prehabilitation; **SCT** = stair-climbing test; **ST** = stress thermometer; **SWD** = shuttle walk distance

Optimal perioperative care envisages a multidisciplinary and integrated medical care from the moment of contemplation of surgery until patient-defined recovery. From the patient perspective, a collaborative approach, shared care, and behavioral changes are reasonable expectations as part of centered care. Although surgery might be technically successful, a significant proportion of vulnerable high-risk patients who undergo surgery do not meet timely patient-oriented outcomes of recovery, such as return to their preoperative muscle strength and functional capacity to perform activities of daily life even up to 6 months after surgery.¹ Prehabilitation is part of the care continuum and, more specifically, is integrated in the preoperative part of the surgical trajectory to facilitate earlier recovery in terms of patient-oriented outcomes. The argument for a multidisciplinary prehabilitation program integrated in the preoperative clinic is presented below, and mechanisms by which a structured and personalized platform can be delivered are also described.

THE PREOPERATIVE PERIOD IS A SALIENT MOMENT

Independent of the patients' clinical status, physiological and metabolic reserve is of utmost importance in the preparation for surgery. The consequence of the stress response that is relevant to patients' aerobic fitness is the increased postoperative energy expenditure.² To meet this demand, both oxygen transport capacity and tissue oxygen utilization capacity (indicators of fitness) need to be efficiently ensured. Further, there is an accelerated age-related decline in aerobic capacity, from 6% to 20% in adults over the age of 70 years. Preoperative aerobic fitness and substrate availability remain important determinants that can accelerate postoperative recovery. Despite the importance of these factors, cardiopulmonary fitness, muscle strength, and nutritional status are not part of the routine preoperative assessment. Among patients' risk factors that can be modified, preoperative functional capacity, psychologic status, and dangerous lifestyle habits can be modified if timely addressed before surgery.

PREHABILITATION IS A PARADIGM SHIFT IN PREOPERATIVE CARE

The typical vulnerable high-risk surgical patients are characterized by low functional ability to cope with stressful events and readily complain of fatigue and exhaustion on mild exertion. It is common practice to intervene after surgery to help patients recover functionally; however, from a physiological and medical perspective, it would make sense to intervene before surgery while patients still have some physiological reserve and can be engaged in the process of improving

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their function. As perioperative physicians, this is an opportunity for anesthesiologists to modify risk factors.³ Prehabilitation programs do indeed represent a teachable moment for lifestyle changes and provide a platform for shared decision-making based on a collaborative and holistic clinician-patient relationship. Patients become engaged in the whole process of becoming fitter and benefit from this collaborative experience. In addition, they acquire the emotional or physical ability to overcome successfully any challenges that might occur after surgery.⁴

Comorbidities represent a powerful influence on risk in people undergoing major surgery, and the effective management of it is paramount. However, many of these comorbidities have an intrinsic relationship with lifestyle habits. Thus, disease management occurring in the preoperative clinic ought to be complemented by behavioral interventions defined in a prehabilitation program. Such approach might improve short- (perioperative) and long- (health-related) term outcomes, assuming the possible association between the immediate postoperative physiological impact and the late functional disability and quality of life (Figure 1). The assumption that behavioral changes in anticipation of surgery may affect long-term outcomes needs further evidence, and, if it holds true, it will support the paradigm that the holistic approach of perioperative medicine would benefit population health.^{6,7}

SHOULD THE PREOPERATIVE CLINIC BE REDESIGNED?

Perioperative pathways have highlighted the importance of setting up preoperative clinics not only to stratify preoperative risk; perioperative medicine

should focus on the optimization of patients’ medical conditions and functional status, the redefinition of patients’ centeredness by a real shared-decision approach. However, preoperative assessment takes place a short time before surgery, even for high-risk patients, which leaves little time for management of preoperative risk factors. This aspect of care is, therefore, still organized around specialties rather than patient needs. Specialists work in silos with the patient moving from 1 consultation office to another and proving the system to be potentially costly. With the growing number of older patients, complex chronic conditions, and unhealthy lifestyle habits (inactivity, smoking, obesity, abuse of alcohol, and recreational drugs), there is a need for a reappraisal of the entire perioperative process. This is more evident when there are nonsurgical alternatives to treatment, where patients are not often ready for surgery.

The preoperative assessment clinic should then become a preoperative assessment and management clinic where patients with modifiable risk factors are dealt with in a multidisciplinary fashion. To this extent, the integrated clinic is redesigned in timing, function, and requirement. The anesthesiologists, because of their training as perioperative physicians, can lead the team involved in risk assessment and risk attenuation.

PREHABILITATION WITHIN THE PREOPERATIVE CLINIC

The prehabilitation program should occur early in the clinical evaluation of a high-risk patient scheduled for either major or outpatient surgery; the earlier the patient can be evaluated, the more likely they will be able to have an adequate preparation and a

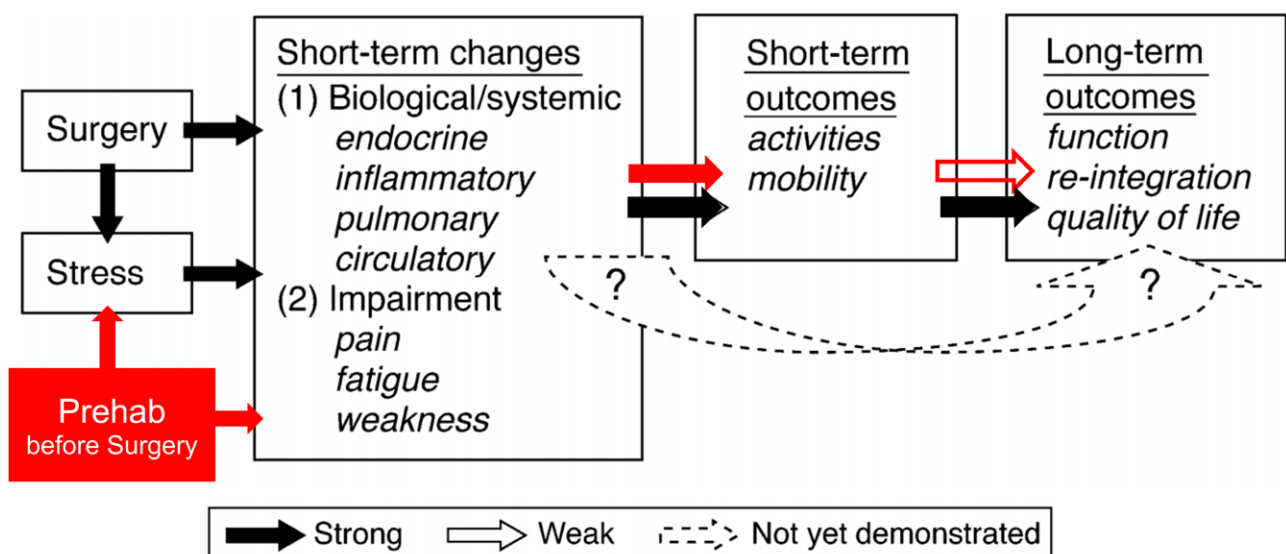


Figure 1. A model for improving surgical outcome. Surgery can impact short- and long-term outcomes (black arrows indicate a negative effect). Prehab aims to lower the stress response and impact on short outcomes, but remains to be shown if this effect has long-term consequences (red arrows represent the potential benefit). Adapted from Carli and Mayo.⁵ Prehab indicates prehabilitation.

meaningful intervention while complying with institutional and national guidelines for the length of time-to-surgery from diagnosis. Once risk is evaluated and prehabilitation is considered, the wait-time cutoffs should be judiciously flexible and this should be independent of whether it is day surgery or not. Unfit or frail patients rushed to any type of surgery will likely suffer a prolonged or complicated recovery, and this may have been prevented if optimization was achieved in the preoperative period.¹ Surgeons should clearly discuss and define with the patient the role that preoperative evaluation has in deciding whether surgery represents the most appropriate treatment for their disease. Frequently patients arrive to the preoperative clinic with the wrong expectation that surgery has already been decided and booked, and this visit represents only a “check mark” in their perioperative journey.

It would make sense that treating surgeons or physicians can initiate the referral plan to the preoperative/prehabilitation clinic, based on objective screening tools that take into account the patient’s medical, physical, and nutritional status. At the tumor board, a discussion can take place in a multidisciplinary format about cancer patient fitness to sustain any treatment in addition to surgery. Such an approach requires that a member of the prehabilitation team, like the anesthesiologist, sits on the tumor board and participates in the formulation of a multidisciplinary plan to be discussed with patients. The preoperative team, which includes anesthesiologists, internists, nurses, and sometimes specialists, should work together with the prehabilitation team which includes exercise physiologists or physiotherapists, registered dietitians or nutritionists, and psychology-trained personnel for high-risk patients, and all share the same objectives.

A common platform (Figure 2) can be shared by the integrated preoperative and prehabilitation teams with easy channels of communications and a rational approach to systematic care, thus minimizing duplication. The shared objective is to assess and to improve the risk when indicated, with optimization of clinical determinants of outcomes seen from 2 different perspectives. For example, correction of anemia, which often takes place in the preoperative clinic, would be needed not only to maximize oxygen delivery to the tissues during and after surgery but also to facilitate preoperative exercise training.⁸

ORGANIZATION OF THE MCGILL PREHABILITATION CLINIC

Although prehabilitation has been widely advocated to be included in standard perioperative care,⁹ its implementation is challenging, and literature on clinical models is scarce. In the following section, our

experience in building a prehabilitation clinic is narratively discussed.

Fully integrated in the preoperative center, the goal of the prehabilitation clinic is to provide a comprehensive, patient-centered, multidisciplinary management of perioperative risk, from the moment of contemplation of surgery until full recovery. Functional capacity is the major pivot of perioperative medicine, embodying the patient’s ability to cope with the increased physical, metabolic, and mental demands associated with surgery. The understanding of the pathophysiology of the surgical stress response helps in identifying more accurately the patients best suited for specialistic assessment and guiding treatment.² This is the reason why we pursue an anesthesiologist-led multidisciplinary care. The leading physician has specific competence in designing and coordinating a personalized plan in view of preexisting medical conditions, functional status, disease severity, and type of medical and surgical treatments. Overcoming the silos approach of specialist referrals is a key point. Our pathway is articulated in 4 phases: screening, assessment, intervention, follow-up (Figure 2).

Screening

The screening is the process of identifying high-risk patients from a functional perspective, with the goal of determining who would benefit from a formal assessment and specialized risk management. The first visit with a health care provider (surgeon, family physician, oncologist, or endoscopist) provides the ideal setting to screen for potential risk factors, embodying the idea of perioperative medicine as a multidisciplinary approach that starts at the moment of contemplation of surgery. We suggest a combination of low-technology tests and patient-reported outcomes, which can last between 20 and 40 minutes.

Physical Status. Tests such as 6-minute walk test (6MWT), stair-climbing test, gate speed, and stair-climbing test are reliable indicators of submaximal aerobic fitness and are validated in surgical setting.^{10–12} Handgrip strength estimates overall muscle function and is an easy-to-administer and reliable measure of changes in body composition and nutritional status.¹³

The Duke Activity Status Index (DASI) questionnaire helps to define physical fitness and is a predictor of risk for postoperative morbidity.¹⁴ As biochemical markers, preoperative B-type natriuretic peptides can be indicated to enhance cardiac risk stratification in noncardiac surgery.¹⁵

Nutritional Status. Nutritional status can be screened exploring key features such as weight loss and

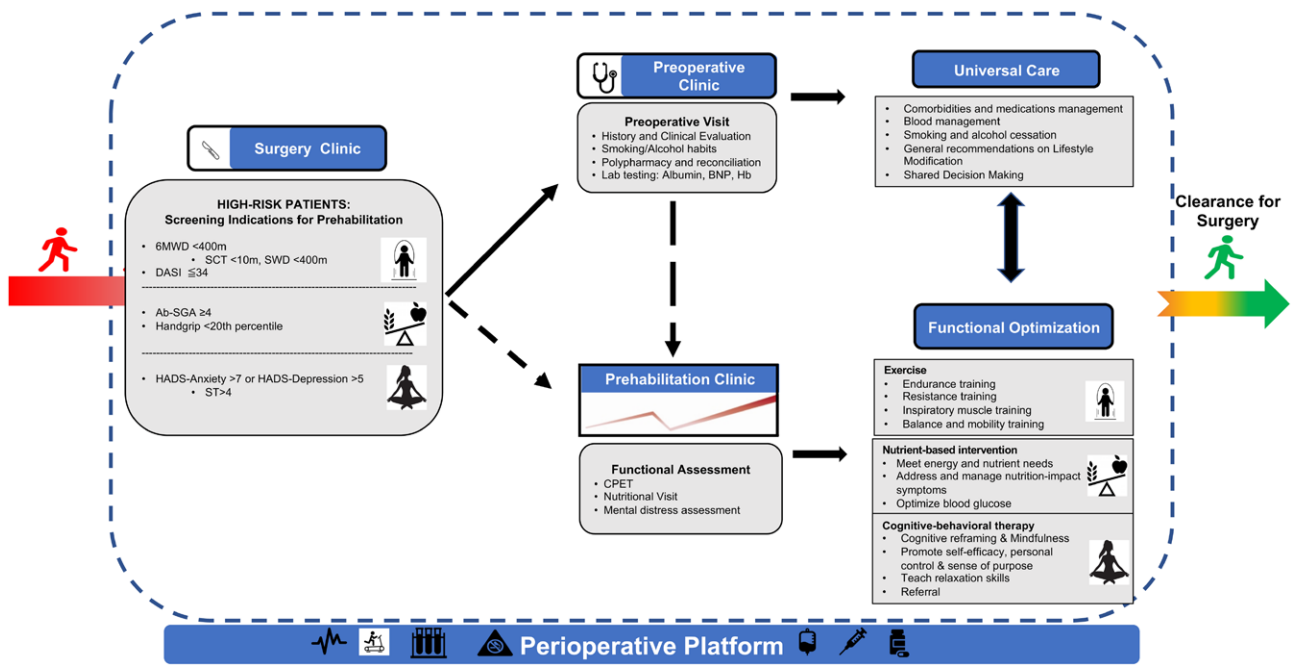


Figure 2. Proposal of perioperative platform. Patients at higher risk are identified either in the surgeons’ office or in the preoperative clinic and then referred to the prehabilitation clinic for functional screening, assessment, and optimization. 6MWD indicates 6-minute walking distance; aPG-SGA, abridged scored Patient-Generated Subjective Global Assessment; BNP, B-type natriuretic peptide; CPET, cardiopulmonary exercise test; DAS1, Duke Activity Status Index; HADS, Hospital Anxiety and Depression Scale questionnaire (Anxiety and Depression subscale); Hb, hemoglobin; HGS, handgrip strength; SCT, stair-climbing test; ST, stress thermometer; SWD, shuttle walk distance.

food intake. Simple questionnaires can support this initial step, for instance, the abridged form of the Patient-Generated Subjective Global Assessment questionnaire (PG-SGA).¹⁶

Mental Status. For routine screening of emotional distress, the Distress Thermometer¹⁷ and/or the Hospital Anxiety and Depression Scale questionnaire¹⁸ are suggested.

After the initial screening, low-risk patients should receive low-intensity interventions as a “universal level of care,” which includes comorbidities and medications management, blood management, cessation of smoking, patient education, and all the elements as per local Enhanced Recovery After Surgery (ERAS) pathways. In addition, general recommendations for exercise, physical activity, diet, and mental health resources must be provided, as a group class, handouts, and/or through online platforms.

Any patient who shows a high-risk profile in the screening phase should be then referred to the prehabilitation clinic for assessment which can last up to 1–3 hours.

Assessment

Physical Status. Cardiopulmonary exercise test (CPET) is the gold standard for the quantification of cardiorespiratory fitness and the risk stratification.¹⁹

Although few institutions utilize it as a stand-alone test, it is not always easily accessible. We have adopted it as a second-line test for patient who fails to meet exercise thresholds at the 6MWT and DAS1. It is particularly informative in a presurgical context, providing a dynamic and integrative evaluation of how cardiac, circulatory, respiratory, and muscle systems respond to an increase in metabolic demand. A trained exercise physiologist and a CPET-competent perioperative physician are indispensable to provide this clinical service.

Nutritional Status. A registered nutritionist or dietitian is mandatory to assess a patient for nutritional risk or malnutrition. Specific nutritional domains include dietary habits, nutrient intake, nutrient goals, physical and body composition status, causes of malnutrition, and barriers to food intake.

Mental Status. The presence of symptoms of emotional distress commonly occurring in the preoperative period are fully explored during a one-to-one session by a psychosocial specialist, who determines the severity of distress, its associated physical symptoms, and plausible causes.^{20,21}

Patients with exercise intolerance, and/or malnutrition, and/or psychological distress are reviewed by the prehabilitation team in concerted action with the surgeon, and a personalized targeted management plan is agreed upon with the patient.

Intervention

Physical Status. Exercise, physical activity, and respiratory muscle training are prescribed as medical interventions either at home or supervised in an exercise laboratory. In this context, CPET conveys a great value because the objective quantification of cardiorespiratory fitness allows the establishment of the level of care, as severe impairment needs to be addressed with an intensive and supervised training program. Moreover, the identification of the exercise-limiting pathophysiological mechanism helps in selecting the most appropriate type of training to target the system that predominantly impairs a patient's exercise tolerance.²²

Nutritional Status. The 2 pillars of nutrition prehabilitation are the avoidance/treatment of malnutrition and the promotion of anabolism. A food-based intervention with balanced macronutrient composition is the first-line approach, but preoperative nutrition may also include therapeutic diets, oral nutrition supplements, enteral nutrition, and/or parenteral nutrition.²³ To support perioperative anabolism, malnutrition must be corrected. Adequate quality, daily distribution, and quantity of protein are mandatory to provide anabolic substrate with resistance exercise, which provides the anabolic stimulus.²⁴ Detailed records of food and fluid intake are encouraged to monitor the program adherence.

Emotional Support. During a one-on-one cognitive-behavioral session, a specialist nurse fosters patients' sense of self-efficacy, purpose, and personal control. Teachable distress-coping strategies are also provided, such as deep breathing, progressive muscle relaxation, guided imagery, mindful meditation, body scanning, and focused attention in the present. A pivotal component is the referral to appropriate services (mental health services, social work, psychiatry, geriatric and geriatric oncology) when psychosocial or cognitive issues are detected.

Follow-up. Follow-up is the salient moment of the real shared decision-making between patients, caregivers, and the oncology/surgical team. The latter shall include a perioperative physician if the patient followed a prehabilitation program or a complex preoperative management. The evaluation of benefits and harms of surgery, which can proceed in parallel to preoperative optimization, should be reevaluated in view of the effect of the prehabilitation program at 1 and 3 months after surgery. Anecdotally, after the "prehabilitation journey," we found our patients to be more empowered and able to think critically and make autonomous, informed decisions about their health.

CRITIQUE AND CHALLENGES

Building a prehabilitation clinic has posed several challenges, such as the financial support, the need of a platform to facilitate referrals to the prehabilitation clinic, the communication between the hospital and the health care facilities, the community engagement, the patients' participation and adherence to the interventions, and the behavioral resistance to change. To address these organizational, financial, and clinical barriers, aiming to maximize access to treatments and better allocate (scarce) resources, we adopted the stepped model care we described. From a clinical perspective, each step is open to discussion and critique as there is no consensus among experts for definition and screening of preoperative risk. To promote the best evidence-based care, the pathway should be steadily updated following the latest findings and the contingent clinical needs. For instance, DASI was introduced in 2018,¹⁴ and its threshold was later modified.¹⁵ Therefore, we strongly believe that the rationale underpinning the model is more important than the single test or the cutoff we proposed.

The screening phase has to follow several criteria:

- First and foremost, all tests must be safe and validated.
- For organizational purposes and cost-effectiveness, low tech testing should be adopted.
- Even the apparently healthy subject should be screened, as a subjective evaluation does not accurately identify patients with poor fitness.¹⁵
- Multiple variables are needed, as no single variable captures the multiple dimensions of function, such as physical, nutrition, and mental status.
- They should take place as early as possible to allow functional optimization and minimizing any delay to surgery.

The challenges of assessment phase are completely different than the ones we face in the screening. While it is not complicated to select good tests and procedures to run a specialistic assessment, it requires more resources in terms of specialized personnel, time, direct and indirect costs, and patients' involvement. To address this thorny point, (1) only patients that show high-risk profile are assessed and referred to specific and personalized tests, and (2) we try to reorganize the resources already existing in the "standard" preoperative clinic.

Besides the barriers related to the higher resource utilization, the intervention phase has to deal with the adherence to the prescribed program is a main issue. In the years, we found that a more personalized and supervised program was associated with higher compliance.²⁵ Nonetheless, face-to-face supervised

interventions are not suitable for patients who live in remote area, work or have low socioeconomic status, and in case of limited access to hospital or rehabilitation centers, such during coronavirus disease 2019 (COVID-19). Technology-driven preoperative exercise interventions have shown to be promising,²⁶ and may be the optimal solution to promote equity and amplify the access to prehabilitation.²⁷ Another important element is the duration of the program, as time can play a key role, in particular in oncologic care. In our experience, a 4-week period is appropriate and effective and be reasonably achieved if the referral comes at the very first moment of contemplation of surgery. The proposed program for now in its infancy will become with time a recognized clinical service to improve the health of those patients at risk.

CONCLUSIONS

The integration of the prehabilitation and preoperative clinics could represent a novel model of perioperative care which aligns with population health management concepts. Patients at risk are identified, and assessment of clinical and physiological impairments together with personalized interventions is initiated. The integration of the prehabilitation and the preoperative clinics facilitates the engagement of patients and the comanagement of their health. To implement this platform, an organized, technologically supported structure is needed within the hospital system and linked with the community or private home, where prehabilitation prescription can occur. Perioperative physicians should work together and lead the reengineering of preoperative care pathways by promoting patient shared decision-making and collaborative comorbidity management together with lifestyle modification. This can succeed if anesthesiologists, surgeons, and internists are fully included and engaged for an effective perioperative population health. The question remains as to whether anesthesiologists want to take the challenge of leading this emerging field of health care. ■■

DISCLOSURES

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