Prehabilitation was first mentioned in a scientific context in 1946. The British Army developed a prehabilitation program as part of an experiment to increase the quality of young recruits. During the war many of the new recruits were suffering from malnutrition and poor lifestyles and, consequently, were in poor physical condition. The British Army conceived a prehabilitation program for these young recruits, consisting of training for warfare, physical therapy, and strength training for the whole body. More than 12,000 men went through the program in 1946, of whom 85% improved remarkably. Above all, the Army wanted improved physical health, but there were also impressive results for recruits’ intellectual capacity. Somehow, these ideas were forgotten and only recently has the concept of prehabilitation found new life.

Interest in prehabilitation returned in the 1980s through the field of sports medicine. The notion of preparing the patient for a surgical procedure had been well known in the physical therapy community before 1985, but not systematically studied. In the early 21st century, Topp et al and Ditmyer et al promoted the following theoretical model of prehabilitation (Figure): presurgical exercise aimed to improve functional capacity before a surgical procedure leads to more rapid postoperative recovery compared with patients who remain physically inactive through the preoperative period.

The Effect of Prehabilitation
Prehabilitation programs have been frequently used during the last 2 decades, and numerous studies have been conducted to investigate their effect. Physical activity is identified as the major component of all programs; however, there is no clear conceptual model for treatment components and exercise progression. Some systematic reviews have examined the general effect of exercise on all types of surgical procedure. Valkenet et al chose to study the effects of “preoperative exercise therapy,” Santa Mina et al investigated the effect of “preoperative total-body exercise,” whereas Cabilan et al chose to study the effect of “any preoperative exercise interventions identified in the study as part of a prehabilitation or preoperative exercise program.” A general conclusion from these studies was that the effect varies depending on the context and content of the intervention.

Other systematic reviews and meta-analyses have analyzed the effect of prehabilitation in relation to a specific surgical context, such as cancer surgery. For patients with prostate cancer, presurgical pelvic floor muscle training significantly enhanced the recovery of continence. Presurgical pulmonary exercise significantly decreased the number of days spent in hospital for patients with lung cancer. Although no studies were found involving physical activity/exercise for breast cancer, 1 psychology-based prehabilitation intervention significantly improved fatigue and depression, whereas 2 others showed no significant effect. Another review indicated that exercise before abdominal surgical procedures (colorectal, unspecified major abdominal, and urological, with cancer as the major diagnosis) led to decreased days in hospital and reduced complications.

For cardiac surgery, a meta-analysis concluded that preoperative interventions significantly reduced time to extubation and the relative risk of developing postoperative pulmonary complications in patients having coronary artery bypass grafts and/or valve surgery. An earlier review of 8 randomized controlled trials investigated the effect of preoperative physical therapy with an exercise component (incentive spirometry, breathing or coughing exercises, respiratory muscle training, exercise training) in preventing postoperative pulmonary complications among patients undergoing surgical procedures involving the coronary arteries and/or valves. The results showed a reduction in postoperative pulmonary complications (atelectasis and pneumonia) and in length of hospital stay.

In the orthopedic context, the evidence for prehabilitation is strongest for ruptures of the anterior cruciate ligament. Recent evidence-based clinical practice guidelines for...
anterior cruciate ligament rehabilitation recommend prehabilitation, based on Level III evidence, with a focus on reducing deficits in knee extension and quadriceps strength prior to surgery.13 Cabilan et al11 identified 13 randomized controlled trials that examined prehabilitation ranging from 3 to 8 weeks, focusing on physical therapist-supervised exercise, in patients undergoing total hip or knee arthroplasty for osteoarthritis. Overall, these studies did not find significant benefit from prehabilitation for patient-reported functional status, quality of life, and pain. These findings were consistent with another meta-analysis12 for patients undergoing hip or knee joint replacement. Prehabilitation has been less studied in patients undergoing surgical procedures of the spine. Four studies are currently available, and none of those showed any statistically significant differences on the primary outcome between the active intervention and the control group.5,19–21

Where Is the Field Going?
There is increasing support for broader prehabilitation programs, where the core components are physical activity as well as nutritional care and psychological strategies.22 Physical activity is also a complex behavior that needs to be understood in relation to individual, social, and environmental factors.23 Anxiety and fear about the outcome of surgical procedures are commonly reported by patients, and an increasing number of prehabilitation programs therefore combine physical activity with psychological strategies.19,20,22 Traditionally, physical therapists are not trained systematically to treat psychological reactions, such as anxiety or depression. During the last decade there has been a shift to a more psychologically informed approach in our profession.24,25 Additional training in behavior-change strategies would help facilitate this expanded role for physical therapists.

Recently, the time for prehabilitation has also been identified as a window of opportunity to change health behavior. Prehabilitation also promotes and facilitates health behavior changes not only preoperatively but also during the postoperative period and as a sustainable change of lifestyle.26 The preoperative period could be an optimal time to invest in changing lifestyle aspects such as exercise and diet. So by applying a broader approach to the prehabilitation period, combining exercise and nutrition strategies, the chance for a sustainable healthier outcome will increase.

What Is Missing Within the Field of Prehabilitation?
The methodological quality of prehabilitation studies is low, and equivalent outcomes across intervention and control groups can be attributed to small sample sizes.11–14 Multicenter, high-powered studies are therefore needed, especially for patients at high risk of poor outcomes. Applying such a design, Boden et al27 showed how a single physical therapy session before abdominal surgery can reduce pulmonary complications by half.

Current prehabilitation approaches are positioned along a continuum of intensities and services, ranging from generalized, educational materials to personalized, multimodal, lifestyle, and morbidity-targeted interventions delivered by clinicians. To further optimize the results of prehabilitation, it is suggested that specific high-risk subgroups are targeted, such as people with low physical function or self-efficacy,28 using a screening procedure to identify them.21 The assessment should include an analysis of the problem from a biopsychosocial perspective. Based on that analysis, the goal can either be to increase specific strength and range-of-motion deficits or to address negative attitudes and beliefs about recovery, or both.

There is no “one size fits all,” and a person-centered approach is recommended. At present, different versions of disability measures are used as the primary outcome. It is debatable how well these reflect patient goals.29 New studies have been started, reflected in the many study protocols published,30,31 several of which emphasize the relevance of a person-centered focus. Prehabilitation might not be a new arena, but we need to determine the effectiveness of the various programs now applied in the clinical context. How could we better apply our skills in order to improve health for patients planned for surgical procedures?

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