# Do patient and clinician goals align in a prehabilitation setting? A mixed methods study

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**Abstract**

**Background.** Engaging patients in healthcare can empower them to take an active role in their treatment, improve their understanding of medical decisions, and foster better communication with healthcare providers, ultimately improving treatment adherence, outcomes, and satisfaction. To enhance patient engagement in an Enhanced Recovery After Surgery setting, at the PeriOperative Program (POP) prehabilitation clinic, we co-developed (with patients) a handout that invited patients to outline their preoperative goals and its significance. We explored the following research questions: (1) What are the goals of patients receiving prehabilitation? (2) How well do these goals align with the surgeons' reasons for referral to prehabilitation? (3) To what extent does goal alignment influence attainment of surgeons' referral aim.

**Methods.** Using a mixed methods sequential exploratory design, all engagement handouts from September 2021-2023 were evaluated without exclusion. Qualitative responses were transcribed verbatim, and quantitative data on the alignment of patient goals with clinician referrals were collected. Quantitative data on the proportion of patient goals that were completely, partially, or misaligned with surgeon referral were collected concurrently. Qualitative data were analyzed with summative content analysis (NVivo). Quantitative data were analyzed descriptively.

**Results.** A total of 191 patient handouts were reviewed. Surgical indications were lung (38%, n=72) and gastrointestinal diseases (26%, n=49), hernia (19%, n=37), and orthopedic/spinal procedures (17%, n=33). The goal section of the handout was completed by 178 patients and the most frequently reported goals included improving physical health (27%, n=86), simply feeling prepared for surgery (18%, n=56), and improving nutrition (15%, n=49). Rationale for these goals included personal well-being (39%, n=93), to recover well from surgery (20%, n=47), and the well-being of others such as family and friends (15%, n=36). Complete data for alignment

were available for 167 patients. Forty-nine percent of patient goals (n=81) partially aligned with their surgeon's referral, 32% (n=55) fully aligned, and 19% (n=31) did not align (P<0.001). Of the goals that did not align with referrals, smoking cessation and weight loss were the most mismatched. When surgeon and patient goals completely aligned, 85% (n=47) of patients met the referral aim, compared to only 16% (n=5) when goals were misaligned (P<0.001).

**Conclusion.** The top patient goals in a prehabilitation program were to improve physical health, feel prepared for surgery, and enhance nutrition, but only a third of these goals completely aligned with clinician referrals. Patients whose goals aligned with their surgeon's showed significantly higher prehabilitation success compared with patients whose goals did not align. Future research should explore ways to better align clinician goals with patient priorities.

**Keywords: ERAS, patient and public involvement, pre-rehab,** patient engagement, shared decision-making, patient-centered care

**Résumé**

**Contexte.** L'implication des patients dans les soins de santé peut leur permettre de jouer un rôle actif dans leur traitement, d'améliorer leur compréhension des décisions médicales et de favoriser une meilleure communication avec les prestataires de soins de santé, ce qui améliore en fin de compte l'adhésion au traitement, les résultats et la satisfaction. Afin de renforcer l'engagement des patients dans le cadre du programme péri-opératoire (PPO), nous avons élaboré (avec les patients) un document invitant les patients à décrire leurs objectifs préopératoires et leur importance. Nous avons exploré les questions de recherche suivantes: (1) Quels sont les objectifs des patients bénéficiant d'une préhabilitation? (2) Comment ces objectifs s'alignent-ils sur les raisons invoquées par le clinicien pour orienter le patient vers la préhabilitation?

**Méthodes utilisées.** À l'aide d'un modèle exploratoire séquentiel à méthodes mixtes, tous les documents d'engagement de septembre 2021-2023 ont été évalués sans exclusion. Les réponses qualitatives ont été transcrites mot à mot et des données quantitatives sur l'alignement des objectifs des patients avec les références des cliniciens ont été collectées. Des données quantitatives sur la proportion des objectifs des patients qui étaient complètement, partiellement ou mal alignés sur les recommandations des chirurgiens ont été collectées simultanément. Les données qualitatives ont été analysées à l'aide d'une analyse de contenu sommative (NVivo). Les données quantitatives ont été analysées de manière descriptive.

**Résultats de l'étude.** Au total, 191 documents destinés aux patients ont été examinés. Les indications chirurgicales étaient les maladies pulmonaires (38 %, n=72) et gastro-intestinales (26 %, n=49), les hernies (19 %, n=37) et les interventions orthopédiques/rachidiennes (17 %, n=33). Les objectifs les plus fréquemment cités par les patients sont l'amélioration de la santé physique (27%, n=86), le simple fait de se sentir prêt pour l'opération (18%, n=56) et l'amélioration de la

nutrition (15%, n=49). Ces objectifs sont justifiés par le bien-être personnel (39%, n=93), le bon rétablissement après l'opération (20%, n=47) et le bien-être des autres, comme la famille et les amis (15%, n=36). Quarante-neuf pour cent des objectifs des patients (n=81) correspondaient partiellement aux recommandations du chirurgien, 32 % (n=55) y correspondaient totalement et 19 % (n=31) n'y correspondaient pas (P<0,001). Parmi les objectifs qui ne correspondaient pas aux recommandations, le sevrage tabagique et la perte de poids étaient les plus mal adaptés. Lorsque les objectifs du chirurgien et du patient étaient complètement alignés, 85% (n=47) des patients répondaient à l'objectif de l'orientation, contre seulement 16% (n=5) lorsque les objectifs n'étaient pas alignés (P<0.001).

**Conclusion.** Les principaux objectifs des patients dans le cadre d'un programme de préhabilitation étaient d'améliorer leur santé physique, de se sentir prêts pour la chirurgie et d'améliorer leur nutrition, mais seulement un tiers de ces objectifs correspondaient parfaitement aux recommandations du clinicien. Les patients dont les objectifs correspondaient à ceux de leur chirurgien ont obtenu des résultats nettement supérieurs à ceux des patients dont les objectifs ne correspondaient pas à ceux de leur chirurgien. Les recherches futures devraient explorer les moyens de mieux aligner les objectifs des cliniciens sur les priorités des patients.

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**Contribution to original knowledge**

This study is among the first to systematically document and analyze the specific goals of patients participating in a prehabilitation program. By identifying that the most frequently reported patient goals are improving physical health, targeted interventions can be developed that align with patient motivations. This study is also the first to analyze the relationship between patient goals and surgeons' reasons for referral to prehabilitation. This work highlights the gap in communication and understanding between patients and healthcare providers. Furthermore, this study is the first to explore if this alignment between patient and surgeon goals influences the patients' success in prehabilitation, addressing the research gap of whether shared goal setting enhances the effectiveness of preoperative care and patient outcomes. This study also employs a mixed methods sequential exploratory design, integrating qualitative summative content analysis and descriptive quantitative analysis, which enhances trustworthiness, and deeper understanding of the findings.

**Contribution of Authors**

This study was co-designed by Dr. Chelsia Gillis, who had the original vision that was then developed and expanded upon by Dr. Stéphanie Chevalier, Dr. Sender Liberman, and me. For the manuscript of this thesis, I have undertaken much of the work as primary author, with my supervisory committee offering valuable insights and edits along the way. Retrospective data collection for the patient Engagement Handouts, which were filled with the help of peri-operative program (POP) clinicians, was done by me. Under the supervision of Dr. Chelsia Gillis, I wrote the first draft of the manuscript and produced all tables and figures. The final manuscript and thesis submission was reviewed by the co-authors, Dr. Franco Carli, Dr. Sender Liberman, Dr. Stéphanie Chevalier, and Dr. Chelsia Gillis, who provided guidance and feedback throughout this process.

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**List of abbreviations**

MGH- Montreal General Hospital

POP- Peri-Operative Program

PAM- Patient Activation Measure

NGSE- New-Generated Self-Efficacy

SOC- Sense of coherence

6MWT- six-minute walk test

LOS- Length of stay

BCT- Behaviour change taxonomy

POR- Patient-oriented research

ERAS- Enhanced Recovery After Surgery

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# 1. INTRODUCTION

## 1.1. Background and rationale

Patient and clinician goals do not always align (1). Anaesthetists and surgeons primarily emphasize use of clinician-reported outcomes (2). These "clinician goals" specifically target the condition (disease-oriented medical care) and short-term outcomes. For surgical patients, typical disease/clinician-oriented outcomes include length of stay in hospital, rates of readmission, and morbidity and mortality within a 30-day period (1, 3). However, use of patient-reported outcomes, such as resolution of symptoms and satisfaction with care, can capture aspects of recovery that are personally meaningful to patients (i.e., recipients of healthcare), particularly for patients with complex health conditions (1, 4).

Ethically, it makes sense to focus care on patient objectives, as it respects the autonomy of patients, acknowledges their unique values and preferences, and promotes shared decision-making (5, 6); however, few studies have examined whether this approach could enhance clinician-oriented outcomes, especially in the surgical setting (1). This gap in the literature presents an opportunity to explore how patient-centered practices, such as prehabilitation, might influence not only patient satisfaction and recovery but also the attainment of clinical outcomes. Prehabilitation, a proactive approach to preparing patients for surgery, aims to optimize physiological and psychological readiness, potentially leading to improved surgical outcomes and reduced recovery times (7, 8). The potential role of the patient in prehabilitation should be further explored to better understand how integrating patient objectives can enhance clinical outcomes, facilitate the development of more effective prehabilitation protocols, and encourage greater patient engagement throughout the surgical journey. This exploration could contribute to

a more holistic, patient-centered approach in surgical care, promoting both patient well-being and efficiency.

### 1.2. Objectives and research questions

A patient-centered, goal-oriented approach to perioperative care considers the individual's holistic needs and health objectives, including symptom alleviation, improvement in physical functioning and mobility, and restoration of normal social interactions and roles (1, 9, 10). In particular, understanding patient goals can help bridge the gap between patient motivations and clinician expectations, which may enhance program adherence with clinician prescriptions and recommendations (e.g., medication, exercise, nutrition) and overall patient satisfaction (11-14). Contributing to this patient-centered literature, we explored with a mixed methods design, the following research questions:

1. What are the perceived strengths, weaknesses, and objectives of patients involved in a prehabilitation program?
2. To what extent are these patient goals measured?
3. To what extent are patient and surgeon goals aligned, and does this alignment impact the achievement of the goals set by surgeons?
4. Finally, using qualitative methods only, how can an existing prehabilitation patient engagement handout be improved?

# 2. LITERATURE REVIEW

## 2.1. The surgical stress response

Each year, Canadian surgeons perform over 1 million inpatient surgical procedures, as estimated by the Canadian Institute for Health Information (15). Surgery invokes a physiological response to restore structure and function and re-establish homeostasis (8). The magnitude of this physiologic response is at least equivalent to sustained moderate intensity exercise (16, 17). For instance, undergoing major surgery can increase oxygen consumption up to 50% due to a larger required demand for global oxygen (18). The onset of the physiological responses to surgical stress is marked by the activation of the hypothalamic-pituitary-adrenal axis (19). Counterregulatory hormones and cytokines are released to promote healing, including catabolism of skeletal muscle, and synthesis of acute phase proteins (20, 21). While the response is innate, if prolonged or exaggerated, body proteins can be significantly catabolized and can decrease one's capacity to resume pre-surgery function (8). This is particularly worrisome for older adults who may be at increased risk of developing sarcopenia or frailty postoperatively since they are less likely to regain both the quantity and quality of muscle lost during the catabolic response to surgery (22, 23). Introducing care pathways such as Enhanced Recovery After Surgery (ERAS) and prehabilitation can help mitigate the surgical stress response.

## 2.2. Enhanced recovery after surgery (ERAS)

Enhanced Recovery After Surgery (ERAS) is a pathway of standardized care applied before, during, and after surgery that has been shown to improve patient outcomes and advance surgical care (24). This multimodal and multidisciplinary perioperative pathway includes structured, and evidence-based perioperative elements, such as minimally invasive surgical

techniques and avoiding fasting before surgery, that minimize the stress response and promote early attainment of homeostasis (8, 19, 25). A meta-analysis including 2,376 patients from 16 randomized controlled trials demonstrated that the ERAS pathway reduced overall morbidity and shortened hospital stay by 2.28 days without increasing readmission rates (26). Patients with deficits in *preoperative* physiologic reserve are not adequately prepared with the current ERAS elements (27, 28). A patient's physiological reserve contributes to their capacity to endure surgical stress, leading to improved stress tolerance, improved tissue healing and recovery, better muscle preservation, enhanced organ function, maintenance of functional capacity, and decreased risk of post-surgical complications (27, 28).

### 2.3. Surgical prehabilitation

Prehabilitation is aimed at enhancing individual functional capacity to help a patient better withstand a stressful event (29). Prehabilitation interventions often involve exercise, nutrition, psychosocial, and medical optimization delivered within 4-6 weeks leading up to surgery (8). An umbrella review of 55 systematic reviews found that multimodal prehabilitation (nutrition, exercise, and psychological strategies) improved functional recovery and reduced complications, non-home discharges, and length of stay in hospital with low to moderate certainty in adult patients undergoing elective surgery (30). Additionally, a pooled analysis of 76 colorectal patients who underwent prehabilitation (exercise and nutrition) and 63 patients who underwent an identical intervention after surgery (rehabilitation) suggested that prehabilitation reduced post-surgical losses of fat-free mass post-surgery (31). Prehabilitation can also significantly reduce post-operative complications. In an international and multicenter randomized control trial involving 251 colorectal patients undergoing elective surgery, patients

underwent a 4-week in-hospital multimodal prehabilitation program that involved high-intensity exercise 3 times per week, nutrition intervention, psychological support, and smoking cessation (32). For the prehabilitation patients compared to those receiving standard care, results showed that severe complications (17.1% vs. 29.7%) and medical complications (15.4% vs. 27.3%) were significantly lower, respectively (32). These findings suggest that the multimodal proactive strategies applied by prehabilitation (rather than reactive rehabilitation) is a promising approach to better prepare patients to recover well from surgery. The ability of ERAS to reduce surgical complications combined with the ability of prehabilitation to reduce medical complications shows they are complementary and best used in conjunction.

### 2.4. Modifiable risk factors

Prehabilitation enhances functional capacity by targeting modifiable preoperative risk factors. A modifiable risk factor refers to a factor or condition that can be altered or influenced through interventions or changes in behaviour, lifestyle, or medical management (33). These risk factors are within an individual's control and can be modified with support or adjusted to reduce the likelihood of developing a certain disease or experiencing negative health outcomes. Examples of preoperative modifiable risk factors include malnutrition, functional capacity, anxiety, and substance misuse (e.g., smoking, alcohol, drugs) (34, 35). Identifying and treating risk factors can drastically improve patient outcomes. For example, a controlled before-and-after study involving 1591 colorectal cancer patients where the intervention group received prehabilitation consisting of screening for anemia, low functional capacity, and nutritional status for a minimum of 4 weeks prior to surgery, found a significant, 10.9% absolute risk reduction in experiencing a complicated postoperative course, compared to patients undergoing standard

preoperative care, primarily due to a decrease in severe complications (34). As such, pre-operative evaluations and interventions, encompassing nutrition, physical, mental, and medical health assessments, can play a crucial role in optimizing patient outcomes and promoting well-being in the perioperative period (8, 36).

### 2.4.1. Nutrition health

Malnutrition is a term without a universally accepted definition. It encompasses two broad categories: undernutrition and overnutrition (37). Major nutrition groups, including the American Society of Parenteral Enteral Nutrition and the European Society of Clinical Nutrition and Metabolism, define malnutrition as an imbalance of nutrients that affects body composition and functional capacity (e.g., physical and immune function) (38). Malnutrition affects over 1 billion people worldwide, primarily due to factors such as disease, poverty, hunger, political instability, and natural disasters (39). Globally, malnutrition-related deaths account for about 45% of deaths among children under five, with approximately 149 million children stunted and 45 million wasted in 2020 (40). Between 20-50% of adult patients are undernourished prior to hospitalization (41). Early detection and treatment of malnutrition in these patients are crucial for improved outcomes and reduced healthcare costs (42). Yet, malnutrition screening is not a routine practice before surgery (43).

Malnutrition has various causes, including inadequate dietary intake, malabsorption, increased nutrient losses, and increased nutrient requirements (37, 39). Malnourished patients have poorer clinical outcomes, including longer hospital stays, increased risk of complications, and higher mortality rates (31). A prospective cohort study of 5709 patients undergoing elective colorectal or gastric surgery estimated that 32% of early deaths in low- and middle-income

countries and 40% of early deaths in upper-middle-income countries were mediated by severe malnutrition (44). Malnourished patients also have poorer patient-oriented outcomes including physical and mental status. As an example, amongst colorectal patients awaiting elective surgery, a retrospective analysis by Gillis et al. showed that as malnutrition status worsened (measured with the Patient-Generated Subjective Global Assessment), a corresponding and progressive decline was observed in the performance of the 6-minute walk test (43). In contrast, correcting malnutrition prior to surgery is associated with improved outcomes. A prospective cohort study found that a 50% reduction in postoperative morbidity was experienced by abdominal surgery patients who received parenteral or enteral nutrition therapy for only 5 to 7 days prior to surgery (19, 45). Early identification of malnutrition and prompt interventions in the pre-op clinic setting can optimize patients' nutritional status, enhance surgical outcomes, and promote better recovery (42).

### 2.4.2. Physical health

A comprehensive physical health assessment in the pre-op clinic is essential for evaluating patients' physical fitness, identifying underlying medical conditions that may impact surgical outcomes, optimizing physical well-being before surgery, and enabling tailored interventions by determining overall functional capacity and potential complications (8, 25, 31).Functional capacity represents an individual's proficiency in carrying out daily activities, recognizing the interconnectedness of physical, psychological, and nutritional states (8, 46). Patients with reduced preoperative functional capacity often have reduced postoperative activity and mobility due to pain, discomfort, or surgical restrictions, leading to muscle atrophy and decreased mobility. A study by Stabenau et al. examined the recovery trajectory based on

preoperative functional status in 250 participants over age 70 undergoing their first major abdominal surgery. The study found that patients with poor pre-surgery function recovered slowly, with approximately 50% of those over 70 showing inadequate functional recovery one-year post-op (22). Therefore, it is important to measure and treat function as it is related to worsened outcomes. Preoperative frailty increases risk of disability and even death from relatively minor external stressors that, under a state of sufficient energy reserve and metabolic capacity, would be better tolerated. A longitudinal study by Buchman et al. followed up with frail clinical patients for up to 8 years and found that in terms of annual change in frailty, each 1-unit increase was associated with almost a five-fold risk of mortality (47).

To prevent surgery-induced frailty, and even (in some cases) regain physical capabilities and independence, targeted, multimodal prehabilitation can be implemented. A comparative study by Minnella et al. found that amongst 106 participants who underwent a multimodal prehabilitation program prior to colorectal surgery, individuals with lower baseline fitness experienced greater enhancements in functional walking capacity compared to those with higher fitness levels (+46.5 [SD 53.8] m vs +22.6 [SD 41.8] m, $P = .012$) and were more recovered at 4 weeks post-op (74% vs. 50%, P = 0.029) (48). This suggests that patients with lower initial walking capacity are more likely to achieve significant improvements in physical function through prehabilitation both before and after undergoing colorectal cancer surgery. Enhancing the patient's condition prior to surgery can mitigate these unfavorable outcomes.

### 2.4.3. Mental health

Surgical procedures can cause stress and anxiety, especially in patients with pre-existing mental health conditions. Consistently, pre-operative anxiety, depression, and low self-efficacy are

linked to poorer physiological surgical outcomes and reduced postoperative quality of life (49). Mavros et al. conducted a systematic review of 16 studies involving 1473 surgical patients, summarizing the influence of psychological factors and physiological outcomes on surgical outcomes, such as wound healing and postoperative complications within the first month after surgery (50). Despite significant heterogeneity, most studies identified a statistically significant association between a psychological variable and the measured outcomes, with some factors showing a protective effect and others associated with negative outcomes. An example of negative outcomes was shown by Hara et al. who conducted a cross-sectional study on 556 spinal cord injury patients and reported a negative correlation between locomotor independence (ability to move and navigate one's environment independently) and symptoms of depression and anxiety, regardless of the cause or duration of the injury (51). Factors associated with favorable outcomes included self-efficacy, low pain expectation, external locus of control, optimism, religiousness, anger control, while those associated with unfavorable outcomes included anxiety, depression, intramarital hostility, anger, and psychological distress (50). Similarly, an evidence-based literature review of surgical outcome studies by Rosenberger et al. examined the impact of mood, attitudinal factors, personality, and coping mechanisms on various aspects of surgical recovery, including complications, pain, functional recovery, hospital stay, and patient ratings of physical recovery (52). Their analysis of 29 surgical outcomes studies across different surgical specialties revealed significant heterogeneity between studies but also consistent factors, such as anxiety predicting short-term operative outcomes and length of stay, while depression was particularly linked to long-term pain. Attitudinal factors, including self-efficacy, positive outlook, and patient-perceived control, were associated with earlier functional recovery (52). Elevated distress (e.g., anxiety and depression) prior to surgery is associated with

a delayed and more challenging postoperative recovery. Assessing and addressing mental health issues allows healthcare providers to address psychological factors that affect the patient's surgical experience, (36) improving patient satisfaction, facilitating better recovery, and enhancing overall postoperative outcomes (8).

### 2.4.4. Medical health

The assessment of medical health in the pre-op clinic is crucial for a comprehensive understanding of patients' medical history, current medications, and potential interactions with anesthesia and surgical interventions (36). The prehabilitation clinic carries out various health assessments such as substance misuse, anemia, and medical optimization (e.g., de-prescribing medications for older adults or adjusting antihyperglycemic agents) which helps in identifying any underlying medical conditions, assessing their stability, and determining the appropriate perioperative management strategies. For example, a meta-analysis involving randomized controlled trials that recruited 2010 preoperative smokers demonstrated the effectiveness of smoking cessation interventions for 4-8 weeks before surgery in reducing postoperative complications (RR 0.42; 95% CI 0.27 to 0.65, 2 trials, 210 participants) promoting long-term abstinence from smoking (53). Additionally, preoperative iron deficiency anemia in patients with colorectal cancer is associated with increased morbidity and mortality, as well as overall fatigue, impaired physical performance, and it represents the most common cause of anemia in these patients (35, 54). Properly assessing a patient’s medical health also provides an opportunity for healthcare providers to address any concerns or questions that patients may have, thereby promoting patient engagement and satisfaction.

## 2.5. Patient adherence and behaviour change techniques (BCTs)

To mitigate complications associated with preoperative malnutrition and other related health issues, patients must adopt behaviour change interventions. Behaviour change techniques (BCTs) are defined as "observable, replicable, and irreducible components of an intervention designed to alter or redirect causal processes that regulate behaviour" (55). A scoping review by Grimmett et al. found 13 recent and ongoing prehabilitation studies in cancer care and nine clinical prehabilitation services that mention a role of behavioural science (55), none of which explicitly described intervention components using the BCT taxonomy. The most frequently utilized technique to encourage behaviour change in the prehabilitation setting was the use of “education/information”, with few studies including strategies like “self-monitoring”, “goal setting” and “motivational interviewing” to enhance compliance (55). The predominant focus on education/information suggests a need for better reporting and/or inclusion of diverse BCTs to determine optimal intervention effectiveness (56, 57).

The BCT taxonomy developed by Michie et al. is the most widely used taxonomy and provides a standardized approach to describing and reporting these interventions, termed the Behaviour Change Taxonomy version 1 (BCTv1) (58), as well as the Behaviour Change Wheel (59, 60). These behavioural science strategies have benefits to offer prehabilitation. For instance, the COM-B model suggests that an individual's behaviour is shaped by the interplay of three factors: their capability to perform the behaviour, the opportunity to engage in it, and the motivation driving the behaviour at that moment (59, 60). A single-center randomized control trial involving 116 prehabilitation patients found the most frequently reported patient barriers to be medical issues (59%) and motivation (31%) (61). A systematic review and meta-analysis of 67 trials found that prehabilitation interventions that implemented behavioural strategies of self-

and clinician-monitoring targeted at smoking behaviour, alcohol consumption, physical activity, and dietary intake reduced length of stay by 1.5 days (n=9 trials, 95% CI -2.6 to -0.4, p=0.01), improved pre-surgery six-minute walk test (6MWT) results by 31.8 meters (n=19 trials, 95% CI 21.2 to 42.4m, P<0.001), sustained this improvement post-surgery (mean difference=34.4m, n=9 trials, P=0.002), and increased smoking cessation rates before surgery (RR 2.9, 95% CI 1.7 to 4.8) as well as at 12 months post-surgery (RR 1.74, 95% CI 1.20 to 2.55) (62). In another example, a systematic review of 25 trials showed that hospital-initiated smoking cessation programs, which included self- and clinician-monitoring of behaviour outcomes with at least one month of post-discharge support, increased smoking cessation rates for six to twelve months after discharge (risk ratio 1.37, 95% CI 1.27 to 1.48) (63), compared to patients who did not receive follow-up monitoring.

### 2.5.1. Importance of establishing goals for behaviour change

Clearly defined goals provide patients with a tangible roadmap, making it easier for them to track progress and stay committed to behaviour changes. A systematic review examining 18 studies on community-based interventions targeting overweight and obese adults, found that specific, time-bound goals with participant involvement and regular feedback (as per S.T.A.R.T. criteria: Specificity, Timing, Acquisition, Rewards and feedback, and Tools) are common components that can be used to support health behaviour change (64). When patients actively participate in goal setting, it empowers them to take ownership of their health, which is a critical factor in sustaining long-term behaviour change. A randomized controlled trial involving 952 patients aged 40 or older with chronic conditions (heart disease, lung disease, stroke, or arthritis) found that a self-management program providing clear daily tasks and accountability,

significantly improved health behaviours and health status, with the treatment group having fewer hospitalizations ($P < 0.05$) and spending, on average, 0.8 fewer nights in the hospital ($P = 0.01$) compared to controls (65). With clear goals and guidance, patients can implement lasting behaviour changes as they are empowered with a structured approach and the confidence to follow through.

Finally, studies that integrate patient-centered objectives as primary endpoints tend to produce better outcomes for both patients and clinicians. A cross-sectional survey of 5,222 inpatients found that patient-centered care (e.g., instruction on behaviour change strategies, self-monitoring practices) significantly improved self-reported physical ($OR = 4.154$, $p < 0.001$) and mental health ($OR = 5.642$, $p < 0.001$), self-reported necessity of hospitalization ($OR = 6.160$, $p < 0.001$), and reduced physician-induced demand behaviours such as unnecessary prescriptions and readmissions (ORs ranging from 0.320 to 0.415, $p < 0.001$) (66). This collaborative approach also fosters a sense of accountability, as patients take ownership of their health and are more likely to adhere to changes when they have played a role in shaping their goals (11).

### 2.5.2. Patient engagement and activation

Patient engagement is a key term in patient-oriented research (POR) where the patients (i.e., those experiencing or who have experienced an issue in health) understand the health information provided, are actively involved in decision-making for their care, give feedback on services provided, and even help conduct research in partnership with healthcare professionals (67-69). POR occurs on a continuum, meaning the partnership includes patients as assets to every stage of the research process but respects the level of engagement desired by the patient

(69). This concept can be key to improving patient outcomes and healthcare practices from more minor health problems all the way to chronic illness (70).

Involving patient activation in the care model sees that patients are empowered and engaged partners in their health management (71). Activation is considered part of successful quality improvements in care, that can lead to better health outcomes and reduced healthcare costs (72). In a cross-sectional study conducted at Fairview Health Services in Minnesota, data from electronic health records were used to analyze a total of 25,047 primary care adults and examine the relationship between patient activation and patient outcomes (73). Researchers utilized the validated Patient Activation Measure (PAM) to investigate 13 patient outcomes in the areas of prevention, unhealthy behaviours, clinical indicators, and costly utilization, discovering that with each additional 10 points in patient activation, the estimated probability of experiencing an emergency department visit, being obese, or smoking decreased by one percentage point (73, 74). Furthermore, patient activation encourages adherence to prescribed therapies. A prospective longitudinal study on patients undergoing spine surgery using the PAM tool found that higher activation scores were positively associated with increased participation ($r = 0.53$; $P < 0.001$) and engagement ($r = 0.75$; $P < 0.001$) in physical therapy (13). Individuals with lower levels of activation were also more inclined to report lower self-efficacy for physical therapy, diminished hope, and an external locus of control, compared to those with higher activation.

### 2.6. Current strategies to engage patients at POP

There is a scarcity of literature on the patient perspectives of prehabilitation. A qualitative study of 20 colorectal patients under ERAS care suggested that these patients would prefer to

actively participate in the preoperative period rather than passively wait for surgery (75). Additionally, a qualitative study in older frail patients participating in an RCT of exercise prehabilitation identified several barriers to participation including pre-existing medical conditions and the weather (12).

To engage patients at the PeriOpereative Program (POP) at the MGH, a goal-oriented patient engagement handout was co-developed with a patient partner to support a positive culture of healing and achieve wellness. This concept requires consideration of both internal and external factors, recognizing the non-linear nature of healing (76). Internally, patients need a sense of hope (belief that recovery is possible) (77), healing (regaining control and defining oneself apart from illness) (78), connection (social process of recovery where one feels they have a purpose) (79, 80), and empowerment (corrective for feelings of lack of control, helplessness, and dependency) to promote optimal recovery (81, 82); while, externally, we must foster an environment that upholds human rights (power and resources are equally distributed) (83), cultivates a positive culture of healing (empowering and engaging professionals and patients) (83, 84), and offers recovery-oriented services (necessary and collaborative treatments provided as well as inclusive language, dignity, respect by professionals and patients) (76, 85, 86). This approach is supported by an environment that enables patients to utilize their resources effectively (76). Using the patient engagement tool, POP aims to support a positive culture of healing by providing patients the opportunity to establish clear goals and receive instructions that empower them to take an active role in their recovery journey.

The tool highlights the four cornerstones of POP: nutrition, physical fitness, mental health, and medical health. Patients are invited to explain their strengths and weaknesses regarding these four components and then use this information to develop a goal to prepare for

surgery along with why this preparation is important to them. The purpose of this handout is to gain perspective on patient goals and level of self-awareness of their perceived strengths and weaknesses to promote program adherence. Establishing goals with patients is an important part of the shared decision-making process. The patient engagement handout has not been evaluated to determine whether multimodal prehabilitation successfully engages patients and meets the needs and priorities of patients.

### 2.7. Knowledge gaps

Although studies have explored individualized priorities for both patients and clinicians (1, 87, 88), there has been limited investigation into how goal setting can influence prehabilitation outcomes. Addressing this gap is crucial for developing more effective, patient-centered care strategies.

#### 2.7.1. Mixed methods design

To address the gap between patient and clinician goals in preoperative care, this study employed a mixed-methods design, integrating both quantitative and qualitative research approaches (89-92). This comprehensive methodology allows for a detailed exploration of patient-centered objectives and their alignment with clinical outcomes, providing a holistic understanding of the research problem. Qualitative methods, including direct patient quotes, provide in-depth insights into patient experiences and perspectives. This method can help uncover the nuanced, personally meaningful aspects of prehabilitation from the patient's viewpoint (92). Quantitative methods can complement this by providing numerical data on patient outcomes and treatment effectiveness enabling the identification of trends, confirmation

of outcomes, and generalization of findings related to patient progress and treatment impact (89). By combining these approaches, mixed method studies support the triangulation of data, merging the "what" and "how much" from quantitative analysis with the "why" and "how" explored through qualitative inquiry (93). This mixed-methods approach is particularly suited to uncover the alignment between patient goals and clinical objectives (89), providing a nuanced understanding of patient engagement and the effectiveness of prehabilitation services, ultimately contributing to improved patient-centered care in preoperative settings (93).

## 3. MANUSCRIPT

**Do patient and clinician goals align in a prehabilitation setting? A mixed methods study**

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**Abstract**

**Background.** Engaging patients in healthcare can empower them to take an active role in their treatment, improve their understanding of medical decisions, and foster better communication with healthcare providers, ultimately improving treatment adherence, outcomes, and satisfaction. To enhance patient engagement at the PeriOperative Program (POP), we co-developed (with patients) a handout that invited patients to outline their preoperative goals and its significance. We explored the following research questions: (1) What are the goals of patients receiving prehabilitation? (2) How well do these goals align with the surgeons' reasons for referring them to prehabilitation? (3) To what extent does goal alignment influence attainment of surgeons' referral aim.

**Methods.** Using a mixed methods sequential exploratory design, all engagement handouts from September 2021-2023 were evaluated without exclusion. Qualitative responses were transcribed verbatim, and quantitative data on the alignment of patient goals with referrals were collected. Quantitative data on the proportion of patient goals that were completely, partially, or misaligned with surgeon referral as well as whether patients met their referral aim were collected concurrently. Qualitative data were analyzed with summative content analysis (NVivo). Quantitative data were analyzed descriptively.

**Results.** A total of 191 patient handouts were reviewed. Surgical indications were lung (38%, n=72) and gastrointestinal diseases (26%, n=49), hernia (19%, n=37), and orthopedic/spinal procedures (17%, n=33). The most frequently reported patient goals included improving physical health (27%, n=86), simply feeling prepared for surgery (18%, n=56), and improving nutrition (15%, n=49). Rationale for these goals included personal well-being (39%, n=93), to recover well from surgery (20%, n=47), and the well-being of others such as family and friends (15%,

n=36). Forty-nine percent of patient goals (n=81) partially aligned with their surgeon's referral, 32% (n=55) fully aligned, and 19% (n=31) did not align (P<0.001). Of the goals that did not align with referrals, smoking cessation and weight loss were the most mismatched. When surgeon and patient goals completely aligned, 85% (n=47) of patients met the referral aim, compared to only 16% (n=5) when goals were misaligned (P<0.001).

**Conclusion.** The top patient goals in a prehabilitation program were to improve physical health, feel prepared for surgery, and enhance nutrition, but only a third of these goals completely aligned with surgeon referrals. Patients whose goals aligned with their surgeon's showed significantly higher prehabilitation success compared with patients whose goals did not align. Future research should explore ways to better align clinician goals with patient priorities.

**Keywords:** ERAS, patient and public involvement, pre-rehab, patient engagement, shared decision-making, patient-centered care

## 1. Introduction

Every year, over one million major surgical procedures are performed in Canada and approximately one-third of these patients experience serious complications (1). Prehabilitation is a proactive approach to mitigate postoperative complications and enhance recovery through preoperative optimization of surgical risk factors (2-4). An umbrella review of 55 systematic reviews found that prehabilitated patients with cancer saw improvements in functional recovery (moderate certainty evidence), fewer complications after surgery (low to very low certainty evidence), and shorter length of hospital stays (LOS) (low to very low certainty evidence) (4). However, effectiveness of prehabilitation largely depends on patients' ability to adhere to the intervention (5); that is, adopt significant lifestyle and behaviour changes during an emotionally distressing period (6). Behaviour change necessitates not only a physical but also a psychological readiness to engage with the multifaceted components of prehabilitation programs—such as exercise and nutrition interventions (7, 8). Yet, to date, most prehabilitation interventions have not been grounded in behaviour change models, which are crucial for fostering sustained patient engagement and adherence (6, 9).

Behavior change techniques (BCTs) are defined as "observable, replicable, and irreducible components of an intervention designed to alter or redirect causal processes that regulate behavior" (6, 10) A scoping review of 22 ongoing prehabilitation studies and clinical services by Grimmett et al., (6), found that none explicitly employed the BCT taxonomy for the intervention components; the most frequently reported technique to encourage behavior change was found to be the use of “education/information”, with only a few studies including strategies like “self-monitoring”, “goal setting” and “motivational interviewing” to enhance adherence (6). Education or information sharing is only one small and relatively passive component of

behaviour change/patient engagement that may not optimally promote adherence (10-12). In contrast, active strategies like goal setting, supported by models or frameworks such as the Capability, Opportunity, and Motivation for Behaviour Change (COM-B) (7), are more effective in promoting behavior change partly because patients share in decision-making, leading to more relevant and personalized care (13, 14). In fact, goal setting has been used effectively in other settings to reduce surgical complications. For instance, a systematic review of 140 RCTs on the effectiveness of clinician feedback to patients found that feedback was most effective when it included both specific goals and a detailed action plan (15).

Without a clear goal, motivation to achieve it diminishes, and reciprocally, lacking motivation undermines the pursuit of a clear goal (16). In a single center randomized controlled trial involving 116 prehabilitated patients receiving major gastrointestinal surgery, the most frequently reported patient barriers to program adherence were medical issues (59%) and motivation (31%) (17). By understanding patient goals, we may begin to bridge patient motivations with clinician expectations, increasing program adherence and overall patient satisfaction (13, 17-19). As such, we employed a mixed methods design to address the following research questions: First, what are the perceived strengths, weaknesses, and goals of patients engaged in a prehabilitation program? Second, to what extent did patients have their goals measured? Finally, we evaluated the alignment between patient and surgeon goals, with consideration of patient activation and health literacy, to determine whether alignment influenced attainment of surgeons' referral aim.

## 2. Methods

### 2.1. Design and setting

We used Creswell's sequential exploratory design (20, 21) to conduct a mixed-methods study, in which qualitative data were subsequently explored quantitatively with a historical dataset of patients who had undergone prehabilitation at the Peri-Operative Program (POP), McGill University Health Centre, Canada from September 2021-2023. Integration of mixed data occurred at the methods level as one database (qualitative) informed the data collection approach of the other (quantitative). Institutional ethics approval had been obtained previously (REB#: 2022-8038).

The POP clinic is led by Department of Anesthesia and employs a dietitian, nurse, and physiotherapist with the aim of enhancing preoperative functional capacity to help patients better withstand surgical stress and recover well (22). The prehabilitation intervention is individualized, based on risk assessment and often involves exercise, nutrition, psychosocial support, and medical optimization prior to surgery (Table 1) (23). Patients receive access to this intervention through a referral from their surgeon.

**Table 1.** Characteristics of the Peri-Operative Program (POP) prehabilitation clinic of the McGill University Health Centre (MUHC), Montreal, Canada.

| | |
|---|---|
| **MUHC** | A healthcare center comprising three tertiary and quaternary care hospitals serves the population of Montreal, Quebec, Canada. |

| | |
|---|---|
| | Offers Enhanced Recovery After Surgery (ERAS) care, preoperative clinic appointment (e.g., medical clearance for surgery, substance misuse guidance etc.), and access to a prehabilitation clinic on-site. |
| | As a component of the ERAS pathway, patients attend a preoperative clinic appointment before surgery for medical clearance and instruction on the ERAS components. |
| **Prehabilitation program (POP)** | Located within the Montreal General Hospital (MGH) |
| | Funded philanthropically |
| | A clinical team consisting of a full-time physiotherapist, a part-time dietitian, a full-time nurse, and a full-time administrative agent. |
| | Attends to roughly 200 surgical patients yearly across different specialties. |
| **Referral to POP** | Referral to the prehabilitation clinic is contingent upon any member of the treating team making the referral. However, referral is almost always from the surgeon. |

### 2.2. Data collection: qualitative

To answer our first research question: what are the perceived strengths, weaknesses, and goals of patients engaged in a prehabilitation program, we evaluated the free text responses from our Patient Engagement Tool (Supplementary Figure 1). This tool was developed in partnership

with an experienced patient-partner to promote patient engagement, goal setting and behaviour change throughout the prehabilitation course. Patients completed the tool at baseline, in partnership with the nurse, by recording their perceived strengths and weaknesses in four categories: nutrition, physical, mental and medical health, followed by two central questions that ask, “what is your goal for surgery?” and “how will you prepare for surgery”. All available engagement tools were transcribed verbatim (KB), and responses charted in Excel.

### 2.3. Data analysis: qualitative

Data were analyzed by KB using summative content analysis, which offers a structured approach for systematically analyzing extensive textual data from medical records (24, 25), as defined by both Kleinheksel (24) and Hsieh (25), including 1) data immersion to identify units of meaning, 2) organizing units into established codes and subcodes, 3) counting and grouping codes into categories, 4) using diagrams, such as concept mapping, to further sort data into overarching categories and sub-categories and 5) defining and interpreting the categories. First, immersion with the data involved uploading the qualitative data into NVivo as well as reading and re-reading text to understand patient responses. Second, data were coded inductively (codes generated from the data itself) because there were no frameworks or previously conducted studies that could be used to pre-define codes. Data were coded iteratively so each time a new code was identified, the previous text was re-coded. Third, codes were counted and grouped which involved calculating the frequency of each code, using the total number of patients responses as the denominator (i.e., more than one response could be possible per patient), to identify emergent patterns and systematically group similar codes into categories. Fourth, before proceeding to interpretation, concept mapping was employed to refine the analysis by identifying

similarities among categories to further condense them into broad categories and sub-categories. Finally, data were then interpreted within the context of the quantitative data to draw conclusions about clinical practice implications.

To enhance credibility and dependability, several strategies were employed based on the Cochrane Critical Appraisal of Qualitative Research (26). Memoing was done through notetaking on potential categories, labels, interpretation of data, and reflexivity, which provided a detailed audit trail of our analytical process. Peer review was conducted by having a second researcher (CG) review the coding scheme and interpretations, ensuring the analysis was subjected to external scrutiny, to enhance the trustworthiness and consistency of the findings.

### 2.4. Data collection: quantitative

Quantitative data were collected to answer our second research question: to what extent did patients have their goals measured? The patient goals (qualitative findings) were used to develop the quantitative data chart. The POP prehabilitation clinic's historical database was reviewed to determine whether the outcome data collected by the clinic aligned with the qualitative patient goals.

At baseline, POP collected data on reasons for surgeon referral, patient demographics as well as exercise, psychological, and nutritional statuses. Intervention outcomes were collected pre-surgery and post-surgery (see Supplementary Table 1). Patients also completed many questionnaires regarding their health and wellness. The Patient Activation Measure (PAM) (27) is a tool used to assess an individual's knowledge, skills, and confidence in managing their own health and healthcare, consisting of 13 items that gauge a patient's readiness and ability to take proactive steps in their health journey according to four activation levels. Scoring for the PAM

ranges from 0 to 100, with higher scores indicating greater patient activation. Scores are divided into four levels of activation: Level 1 (≤47) reflects patients who may not yet recognize the importance of their role in managing their health; Level 2 (47.1–55.1) represents patients who are building confidence and knowledge but struggle to take action; Level 3 (55.2–67) indicates patients who are beginning to take action and set goals; Level 4 (≥67.1) signifies patients who are proactive, maintain behaviors over time, and can cope with health challenges (28). The BRIEF Health Literacy Screening Tool (BRIEF) (110) is a concise questionnaire designed to assess an individual's health literacy, including the ability to comprehend and use health-related information. The questionnaire is composed of four questions that evaluate how confident patients are in filling out medical forms, understanding written health information, and their need for assistance with these tasks. Scoring for the BRIEF ranges from 4 to 20, indicating health literacy as inadequate (4 to 12), marginal (13 to 16), and adequate (17 to 20) (29).

To answer our third research question, to what extent patient and surgeon goals were aligned, the 13 reasons for referral on the prehabilitation referral form (Supplementary Table 2) were charted into Excel and compared to patient goals. The definition of alignment was adapted from Boyd et al, as coordination of decisions and care between patients, caregivers, and other clinicians, aligning with the patient's health priorities and anticipated health trajectory (30).

Finally, to determine whether goal alignment influenced patient outcomes, a priori achievement criteria were assigned to each patient based on whether they achieved their surgeons' referral aim or not (Supplementary Table 2). For instance, for a patient referred to The Clinic for "optimization for major surgery" and achieved a meaningful improvement in preoperative functional capacity, this was considered as achieving their surgeons' aim (31). Two independent reviewers (CG and KB) systematically compared patient-stated goals and their

rationale for those goals with the reason for referral provided by the surgeon. The language and intent (i.e. goal and rationale) of both patient and surgeon goals were assessed to determine whether they were fully aligned (exact match), partially aligned (some overlap), or did not align (no overlap). Patients indicating non-specific willingness to comply with surgeon instructions (e.g. "Whatever they tell me to do") were labeled as "partially aligned". Patients without any follow-up data (including prehabilitation or surgical admission/outcome data), were not cleared for surgery, did not attend appointments, or deceased before surgery, were labeled as not having achieved their referral aim. We hypothesized that more patients would attain the referral aim of their surgeon when their goals were aligned.

### 2.5. Data analysis: quantitative

Quantitative data were analyzed using descriptive statistics including proportions (n, %) and agreement statistics (kappa interrater agreement). Given health literacy or activation can empower patients with the knowledge and confidence necessary to effectively manage their health, thereby increasing the likelihood of achieving their health goals (29, 32, 33), when exploring the association between surgeon referral and attainment of goals, these components were also examined separately. Chi-square analyses were conducted to determine the association between meeting surgeons' referral aim with PAM and BRIEF score categories. Finally, multivariate logistic regression was used to determine predictors of successfully attaining surgeons' referral aim with the following covariates: goal alignment (no alignment, partial, and full alignment), BRIEF continuous score, PAM continuous score, age, sex, and Charleson Comorbidity Index (34).

## 3. Results

A total of 337 patient charts were eligible for review. Of those, 146 (43%) engagement handouts were missing, resulting in 191 (57%) for inclusion. Of these, 90 (47%) were partially completed, and 101 (53%) were fully completed. The demographic data and clinic assessments are shown in Table 2. Included were 114 (60%) females, with a median age of 65 (interquartile range: 57-73) years and the most frequent indications for surgery were lung (n=72, 38%) and gastrointestinal (n=49, 26%) diseases.

**Table 2.** Patient characteristics and baseline evaluation of nutritional, physical, and emotional status prior to surgery for 191 prehabilitated patients**.**

| **Patient characteristics** | **Description** | **Patients (n=191)** |
|---|---|---|
| Sex, n (%) | Sex according to medical chart | Female: 114 (60)<br>Male: 77 (40) |
| Age, years, median [IQR] | Age according to birth year | 65<br>[57-73] |
| Indication for surgery, n (%) | Reason for surgery (disease) according to medical record | Lung: 72 (38)<br>Gastrointestinal:49 (26)<br>Hernia: 37 (19)<br>Orthopedic/spine: 33 (17) |
| Charlson Comorbidity Index (34) score>=3, n (%) | Quantifies the severity of a patient's medical condition to predict mortality risk. A score of three or higher | 131 (69) |

| | | |
|---|---|---|
| | indicates moderate to severe comorbid conditions. | |
| The Rockwood Clinical Frailty Scale (CFS) (35), n (%) | Subjective assessment of frailty status (completed by clinic nurse) based on overall health and functioning. A score of 1 to 9 indicates the level of frailty ranging from very fit (1) to terminally ill (9) | Vulnerable (CFS 4): 11 (6%)<br>Frail (CFS 5-9): 4 (2%) |
| 6-Minute walk test (6MWT), mean (standard deviation) (36, 37) | Measures the distance a person can walk in six minutes to assess their endurance. | 424 (127) meters |
| Hospital Anxiety and Depression Scale (HADS) (38) anxiety score, median [IQR] | A 14-item self-reported scale that evaluates levels of anxiety and depression in individuals based on a standardized questionnaire resulting in a score range between 0-21. | 6 [4-10] |
| Most materially deprived patients, n (%) (39) | Quintiles of 4-5 represent a population lacking access to | 57 (30) |

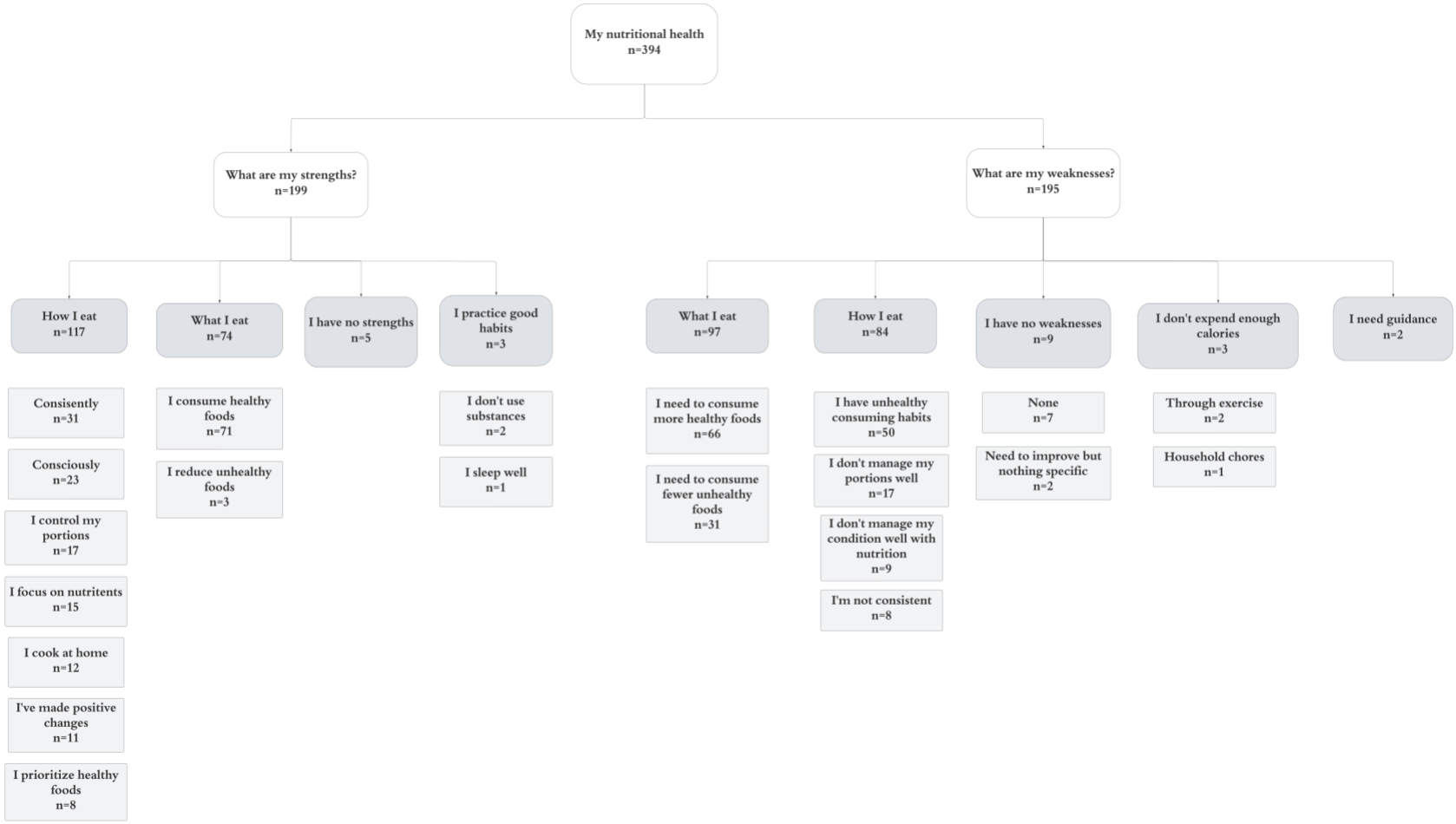
| | | |
|---|---|---|
| | essential material resources or necessities based on their postal code. | |
| Positive Canadian Nutrition Screening Tool (CNST) (40) screening, n (%) | Identifies individuals who are at risk of malnutrition. | 31(16) |

See supplementary Table 1 for detailed list of measurements used at the Peri-Operative Program (POP) prehabilitation clinic.

### 3.1. Strengths and weaknesses

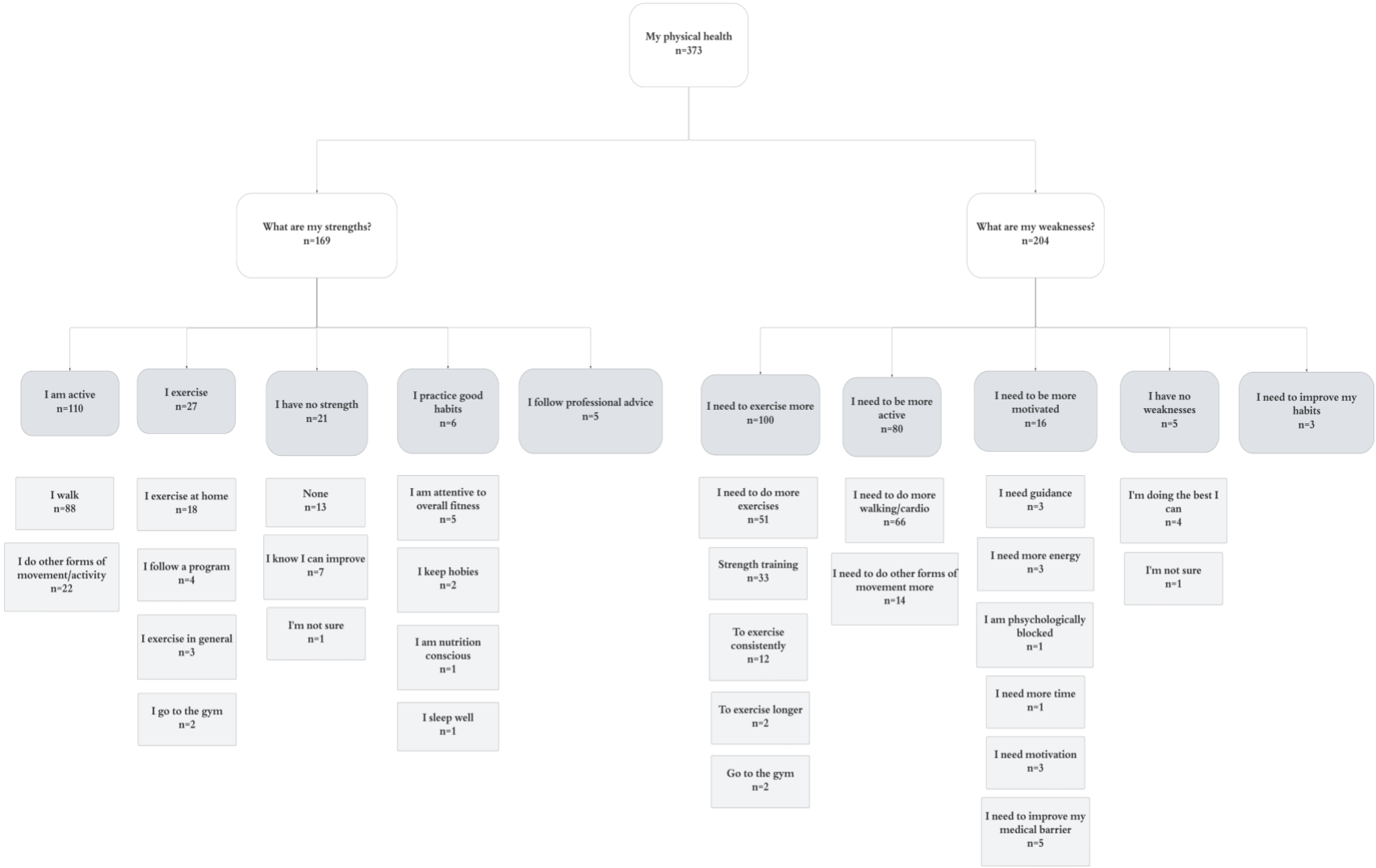
A total of 394 nutrition goals were mentioned by participants, with 51% (n=199) charted as strengths and 49% (n=195) charted as weaknesses (Figure 1). How patients eat, such as consistently, consciously, controlling portions, cooking at home, represented 59% (n=117) of reported nutrition strengths, while what patients eat, including increasing healthy foods, avoiding unhealthy foods, represented 37% (n=74) of reported nutrition strengths. What patients eat (e.g. “quit all the fat food”) also represented 50% (n=97) of reported nutrition weaknesses and how patients eat (e.g. “not use premade sauces - ex: gravy”) represented 43% (n=84) of reported nutrition weaknesses.

**Figure 1**. Categories and sub-categories of nutritional strengths and weaknesses of patients starting a prehabilitation program.



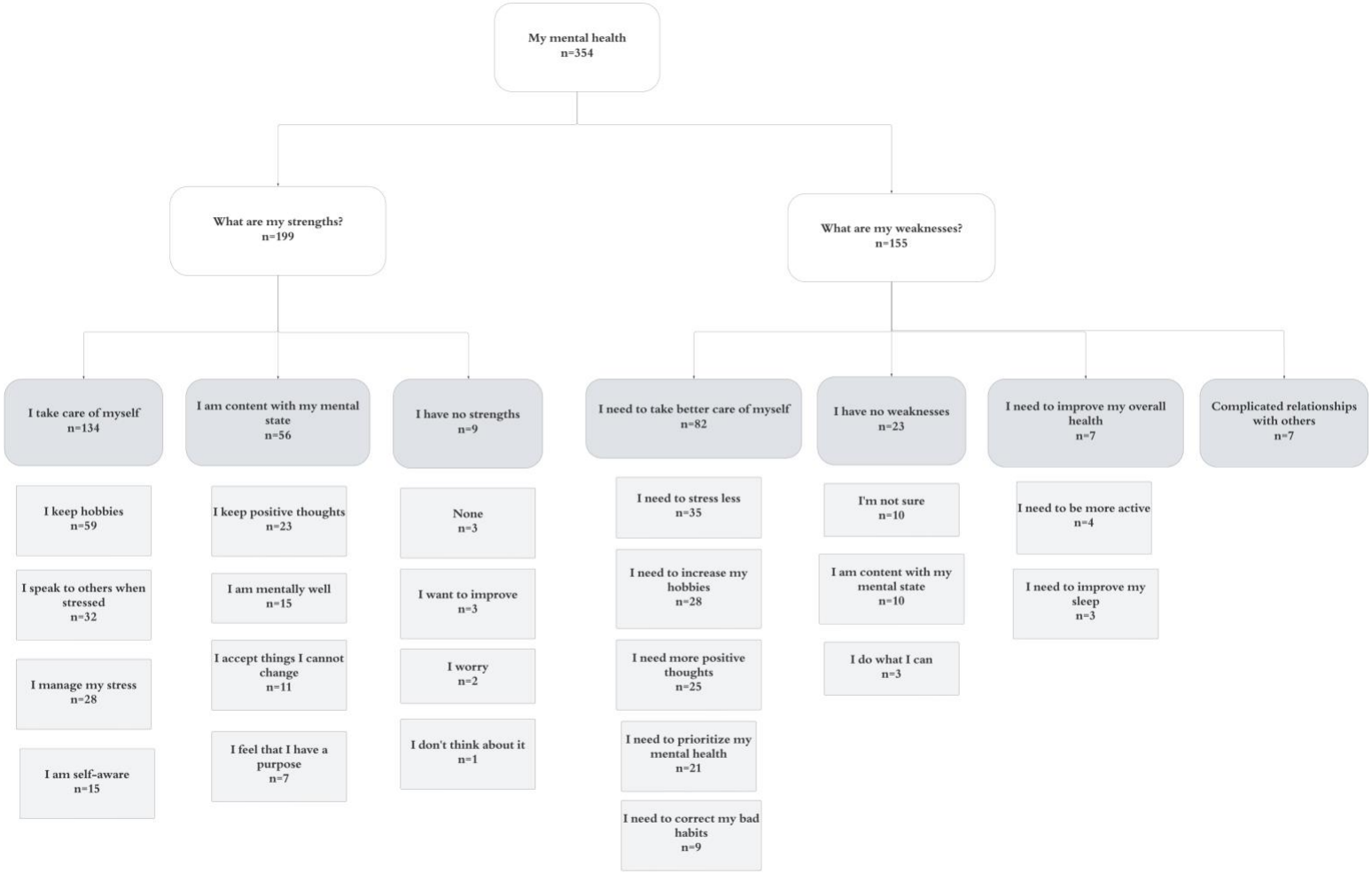
A total of 373 physical health goals were recorded, with 45% (n=169) charted as strengths and 55% (n=204) charted as weaknesses (Figure 2). Engaging in physical activities (e.g. “I work with my body”) represented 65% (n=110) of recorded physical strengths, followed by forms of exercise (following a program, exercising at home, going to the gym). Insufficient exercise (i.e., the need for more frequent, structured exercise) represented 49% (n=100) of reported weaknesses, while being more active (general increase for more daily movement) represented 42% (n=80) of reported physical weaknesses. Lack of motivation to overcome barriers (physical and mental stressors) represented 8% (n=16) of reported physical weaknesses (e.g. “scared of falling outside --> anxious ++”).

**Figure 2.** Categories and sub-categories of physical strengths and weaknesses of patients starting a prehabilitation program.



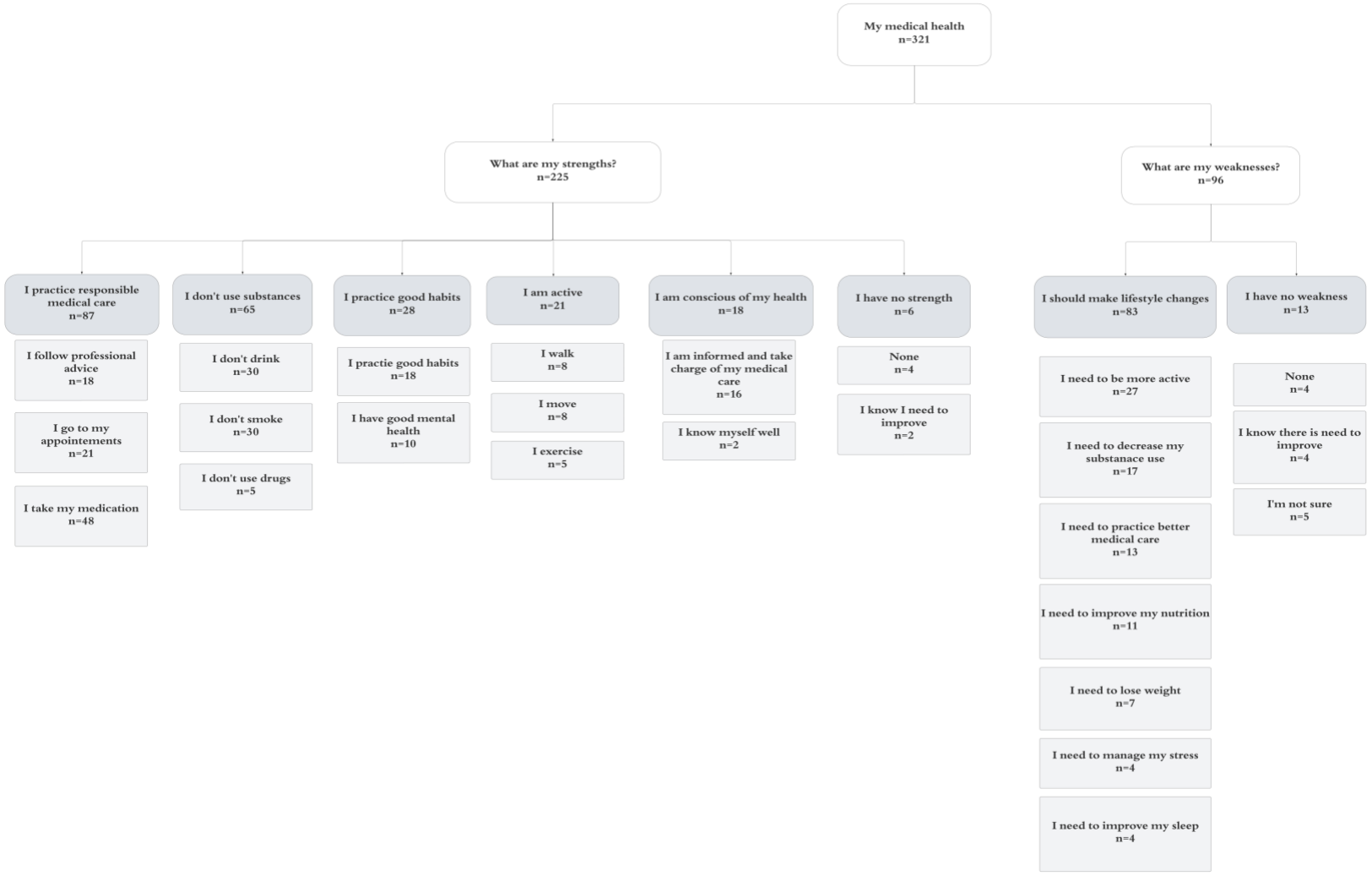
A total of 354 mental health goals were recorded, with 56% (n=199) charted as strengths and 44% (n=155) charted as weaknesses (Figure 3). Self-care, including hobbies, speaking to someone, being self-aware, represented 67% (n=134) of reported mental strengths. Satisfaction with one's mental state, such as positivity, acceptance, and having a purpose, represented 28% (n=56) of reported mental strengths (e.g., "I accept things I cannot change"). Not prioritizing one's mental health (i.e., need to decrease stress, increase hobbies, have more positive thoughts, correct bad habits) was the most frequently charted weakness at 53% (n=82).

**Figure 3.** Categories and sub-categories of mental health strengths and weaknesses of patients starting a prehabilitation program.



A total of 321 goals were stated for medical health, with 70% (n=225) charted as strengths and 30% (n=96) charted as weaknesses (Figure 4). The most frequently charted medical strength was not using substances (alcohol, smoking, drugs) which was represented by 29% (n=65) of strengths. Practicing good medical habits, such as taking medication and attending appointments, as well as taking responsibility for one's health (e.g. "advocate for my healthcare and use resources at my disposal") represented 12% (n=28) of charted strengths. Being active and health-conscious were represented by 9% (n=21) and 8% (n=18) of strengths, respectively. The need to make lifestyle changes was the most frequently recorded in the weakness category, represented by 86% (n=83) of reported weaknesses.

**Figure 4.** Categories and sub-categories of medical strengths and weaknesses of patients starting a prehabilitation program.



### 3.2. What is my goal for surgery?

Of the 191 handouts, 178 respondents completed the goal section. A total of 318 different goals were grouped into eight categories and 27 sub-categories (Table 4 and Table 5, respectively), with the top three described below. Overall, physical health goals were represented most (27%, n=86) and highlighted exercising more (n=37), being more active (n=16), working on one's self-image (n=15), and building strength and muscle (n=9). General preparedness for surgery was the second most recorded goal (18%, n=56), which described feeling ready for surgery by following the prehabilitation program (n=27), feeling informed before surgery (n=9), resting more (n=9), and having one's life in order before surgery (n=6). Improving nutrition was the third most reported goal (15%, n=49), and included improving nutritional status (n=26) and following a specific eating plan or diet (n=23). The alignment of patient goals with current clinic measurements is shown in Table 5. Forty-four percent of patient goals were measured at POP (n=12/27 sub-categories). Four out of five patient goals related to physical health were measured, with self-image being the only goal not measured. In being prepared for surgery, 3 of the 6 goals were measured. None of the specific patient goals related to nutrition or mental health were measured.

**Table 4.** Patient goals for surgery grouped into categories with prevalence of responses and exemplary quotes.

| **Patient goal** | **Prevalence of goal, n (%)** | **Exemplary quotes** |
|---|---|---|
| To improve my physical health | 86 (27) | "I will do more exercises to be in better physical condition". |
| To be prepared for surgery | 56 (18) | "I would like to train, inform myself, and prepare myself psycho/emotionally" |
| Improve my nutrition | 49 (15) | "Eat cleaner/healthier" |
| Work on my mental health | 42 (13) | "Fear of surgery" |
| Improve my medical health | 40 (12) | "Replace nicotine w/ cannabis & stop crack" |
| To reach an ideal weight | 34 (11) | "Reduce my excess weight as much as possible" |
| No goal | 8 (3) | "I don't know, I followed the POP program" "ASAP want to do surgery. Don't think need prepare" |
| To return to a previous state of health | 3 (1) | "I want to get well enough to cut my grass" |

**Table 5.** Patient goals and whether they are measured by the PeriOperative Program prehabilitation clinic

| **Patient goal** | | **Currently measured** | **NOT measured** | **Current measurements or recommendations to enhance patient-orientation** |
|---|---|---|---|---|
| To improve my physical health | Exercise more | ☑ | | Current: Logbooks<br>Recommend: GODIN questionnaire (41). |
| | Improve self-image | | ☑ | Recommend: Rosenberg Self-Esteem Scale (42). |
| | Be more active | ☑ | | Current: Duke Activity Status Index (43) and the Community Health Activities Model Program for Seniors physical activity self-reported questionnaire (CHAMPS) (44) questionnaires. |
| | Increase strength and muscle | ☑ | | Current: Handgrip (45), sit-to-stand (STS) (46), Bioelectrical Impedance Analysis (BIA) (47) |

| | | | | |
|---|---|---|---|---|
| | Improve cardiovascular status | ☑ | | Current: Maximal Oxygen Uptake (VO2 max) (48), 6-Minute Walk Test (6MWT) (36, 37). |
| To be prepared for surgery | Following the prehabilitation package | ☑ | | Current: Adherence tracked with logbooks. |
| | Rest well | | ☑ | Recommended: Sleep Quality Scale (SQS). Actigraph (sleep) monitor (49). |
| | To be informed before surgery | | ☑ | Recommend: Preoperative Informed Consent Procedure (50, 51) Preparedness for Colorectal Cancer Surgery Questionnaire (PCSQ) (52, 53). |
| | Have life in order and prepare others | | ☑ | Recommend: Unaware of existing validated scale; however, some relevant questions in the Functional Assessment of |

| | | | | |
|---|---|---|---|---|
| | | | | Cancer/Chronic Illness Therapy (FACT) (54). |
| | Improve overall health | ☑ | | Current: Physiological metrics such as blood pressure, nutritional and physical status, patient-reported outcomes and quality of life such as the EuroQOL-5 Dimensions (EQ-5D) questionnaire (55). |
| | Get the surgery over with | ☑ | | Current: Time to surgery. |
| Improve my nutrition | Eating better and drinking water | | ☑ | Current: Nutritional status is measured (e.g. Patient-Generated Subjective Goal Assessment, PG-SGA (56). Recommend: Diet quality and habits are not measured. This can be done with screeners: Canadian Food Intake Screener (57), |
| | Improve diet | | ☑ | |
| | Practice good eating habits | | ☑ | |
| | Reduce portion sizes | | ☑ | |

| | | | | |
|---|---|---|---|---|
| | | | | Canadian Eating Practices Screener (58). |
| Work on my mental health | Improve overall state of wellness | ☑ | | Current: EQ-5D (55) |
| | Be more positive | | ☑ | Recommend: Sense of Coherence (SOC) questionnaire (59). |
| | Cope with stress | ☑ | | Current: Hospital Anxiety and Depression Scale (HADS) (38) and Distress Thermometer (60). |
| | Find motivation | ☑ | | Current: Capability, Opportunity, and Motivation for Behaviour Change (COM-B) (7). |
| | Be mentally prepared for surgery | | ☑ | Recommend: We are currently unaware if a tool exists to measure this; however, preparedness for Colorectal Cancer Surgery Questionnaire (PCSQ) may be acceptable (52, 53). |

| | | | | |
|---|---|---|---|---|
| | Accept condition | | ☑ | Recommend: FACT (54). |
| Improve my medical health | Follow prescriptions given by medical professionals | ☑ | | Current: Logbooks |
| | Decrease substance use | | ☑ | Current: Smoking only is assessed.<br>Recommend: The Substance Use Treatment Barriers Questionnaire (SUTBQ) (61). |
| | Manage medical condition | ☑ | | Current: Medical data such as Hemoglobin levels, diabetes medication monitoring. |
| To reach an ideal weight | Gain or lose weight | ☑ | | Current: Weight at each appointment. |
| To return to a previous state of health | Recover from surgery including speed and quality of recovery | | ☑ | Current: Hospital length of stay (LOS) is measured.<br>Recommend: Postoperative Quality of Recovery Scale (PostopQRS) (62). |

| | | | | |
|---|---|---|---|---|
| | Resume a previous passion | | ☑ | Recommend: We are currently unaware of an existing tool that measures this. |

### 3.3. Why am I preparing for surgery?

Of the 191 handouts, 173 completed the rationale section. A total of 237 different rationales or motivations in preparing for surgery were mentioned and have been organized into 6 categories (Table 6), with the top three described below.

*"For me*" was the most frequently mentioned category, represented by 39% (n=93) of recorded responses, and focused primarily on the patient themselves. Within this category, sub-categories included improving one's physical health (n=32), living a long and healthy life (n=30), improving one's mental health (n=11), reducing pain and discomfort (n=10), improving one's self-image (n=4), moving forward with life (n=4), and being more resilient (n=1).

*The desire to recover* was represented by 20% (n=47) of patient rationales and encompassed 1) how they wanted to recover (n=27), which included recovering well, fully, and quickly (shortest hospital stay possible) and 2) returning to a previous state of health or better (n=10).

*For others* represented 15% (n=36) of the primary motivations for preparing for surgery. Patients felt responsible for caring for others (n=14), wanted to spend time with friends and family (n=13), to travel and play with children and grandchildren (n=6), and to witness family milestones (n=3).

**Table 6.** Patient rationales for their recorded goals grouped into categories with sub-categories, prevalence of responses, and exemplary quotes.

| Rationale category and prevalence, n (%) | Sub-categories and prevalence, (n) | Exemplary quotes |
|---|---|---|
| For me, 93 (39) | Improve physical health (32) | *Avoid moments of despair.* |
| | Live a long and healthy life (30) | *Body image. More or less 28 years I have suffered.* |
| | Improve one's mental health (11) | *I want to get on with my life. Right now, I am on hold.* |
| | Reduce pain and discomfort (10) | *Life is beautiful and I want to live the book of my life until the last chapter.* |
| | Improve one's self-image (4) | |
| | Move forward with life (4) | |
| | Be more resilient (1) | |
| To recover, 47 (20) | Quality of recovery (37) | *I want to be able to do the things I was once able to do.* |
| | Return to a previous state of health or better (10) | *I want to recover quickly and be able to do what I did before surgery.* |
| | | *I know it's better to be in shape for recovery.* |

| | | |
|---|---|---|
| For others, 36 (15) | Responsibility for others (14) | *I have a six-month pregnant wife and one year old at home. Pappa is needed.*<br>*I want to survive when my children still have kisses from me.*<br>*Fit to go to Italy with my daughter.*<br>*I want to live longer to see my granddaughter get named*<br>*I want to watch my grandchildren grow up. I don't want to miss out on their awesomeness!* |
| | Spend time with friends and family (13) | |
| | Travel and play with children and grandchildren (6) | |
| | Witness family milestones (3) | |
| To avoid future health problems, 28 (12) | Resolve current ailment (17) | *I want to live a normal life without an ostomy.*<br>*I'm afraid of having more intestinal obstructions.*<br>*I do not want to have a handicap.* |
| | Avoid a recurrence of ailment (6) | |
| | Avoid complications after surgery (5) | |
| To have a successful surgery, 21 (9) | Survive surgery (14) | *To survive and live a long, good life.*<br>*I want to get through the surgery with flying colors.* |
| | For the surgery to go well (7) | |
| | Prehabilitation supports recovery (6) | *Because that's what needs to be done.* |

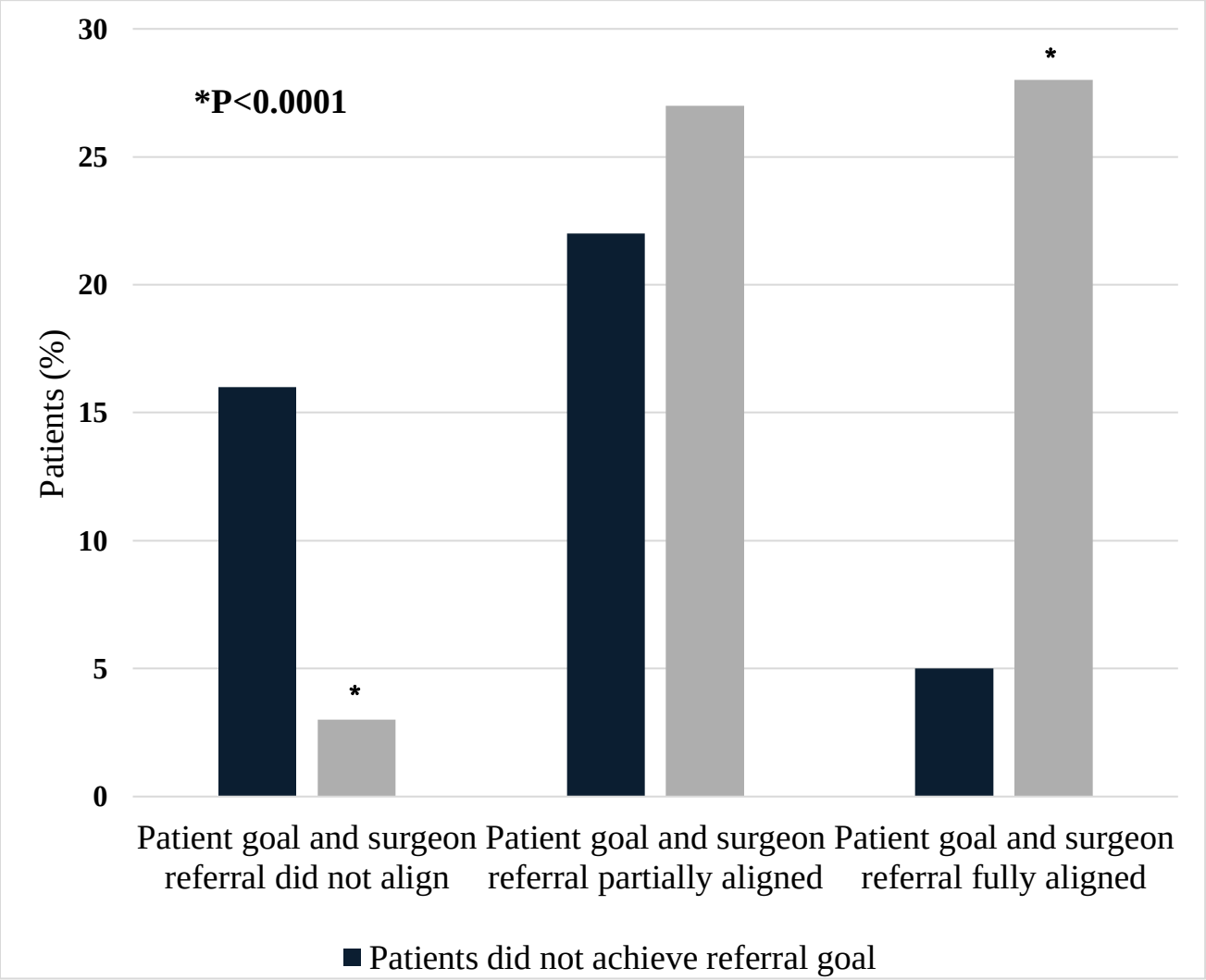
| | | |
|---|---|---|
| To utilize the prehabilitation pathway, 12 (5) | To be pragmatic (4)<br>Accountability (2) | *I need and want to be accountable for my actions by being healthy and mindful.* |

### 3.4. Alignment of patient and surgeon priorities

Complete data on 167 patients were available for analysis (e.g., goal section missing, n=6; incomplete patient records, n=18). Of the 13 listed reasons for surgeons to refer patients, the most frequently recorded were optimization for "major surgery" (n=73, 38%), "smoking" (n=63, 33%), and "BMI less than 18 or greater than 40" (n=55, 29%) (Supplementary Table 2). Reviewer agreement for determining whether patient and surgeon goals were aligned and whether patients met their referral goal was 97.8% (Kappa: 0.96) and 98.2% (Kappa: 0.97), respectively ($p<0.0001$). Forty-nine percent of patient goals (n=81) partially aligned with their surgeon's referral, 32% (n=55) fully aligned, and 19% (n=31) did not align ($P<0.001$). Fifty-eight percent of prehabilitated patients achieved their surgeons' referral aim (n=97/167). Of these "successful" patients, the vast majority had goals aligned with their surgeons: 95% (n=92/97 vs. 5/97, $P<0.001$). In fact, when patient and surgeon goals were misaligned, only 16% (n=5/31) achieved their surgeon's referral aim, compared to 85% (n=44/55) when goals were fully aligned ($P<0.001$; Figure 5). The most frequently misaligned goals were related to smoking and weight loss, while the most frequently aligned goals were related to the optimization of patients undergoing major surgery or neoadjuvant therapy. Neither health literacy (BRIEF <13: n=19/38 vs. BRIEF >=17: n=50/88, P=0.570) nor patient activation (PAM <=47: n=20/39 vs. PAM >67: n=43/72; P=0.855) significantly influenced attainment of referral aim (Supplemental Table 3). After adjusting for health literacy, patient activation, age, sex, and Charlson Co-morbidity Index,

the only significant predictor of attaining surgeons' referral aim was goal alignment (unadjusted OR: 1.6, 95% confidence interval: 1.1-2.4, P=0.026; adjusted OR: 1.6, 95% confidence interval: 1.1-2.5, P=0.024; Supplementary Table 4).

**Figure 5.** Comparison of patient goal alignment with the achievement of surgeons' referral aim among 167 patients who received prehabilitation (* P<0.001).



## 4. Discussion

### 4.1. Summary of findings

Our mixed methods study identified several perceived strengths, weaknesses, and goals of patients preparing for surgery with prehabilitation. The top patient-reported goals included improving physical health, generally being prepared for surgery, and improving nutrition for themselves (the patient), to recover, and for others (family and friends). While physical health was a commonly measured prehabilitation outcome, preparedness for surgery and the nutrition outcomes prioritized by patients were often not measured. The most frequent reasons for referral to prehabilitation by surgeons included optimization for major surgery, smoking cessation, and a BMI of less than 18 or greater than 40. Most surgeon referrals were aligned or partially aligned with patient goals; when aligned, most patients met the referral aim. In fact, goal alignment was the only significant predictor of attaining surgeon referral aim amongst several variables, including age, sex, health literacy, patient activation, and a co-morbidity index.

We found that 32% of the preoperative goals for patients in a prehabilitation program *completely* aligned with their surgeons. Several other studies have documented misalignment between clinician and patient priorities (63-66). For instance, Crowe et al reviewed the treatment priority lists from James Lind Alliance Priority Setting Partnerships and identified that drugs were the most preferred, currently evaluated treatment by researchers, but only 18% of patients prioritized this type of treatment (65). In the co-design of an application for knee osteoarthritis, a mixed methods study found that physicians and patients disagreed on the type of graphs to be displayed in the app (64); patients preferred graphs of symptom management and tracking of goals, while physicians preferred adherence to exercise prescriptions. In the surgical setting,

patients who had undergone a primary knee or hip replacement surgery were surveyed about hypothetical scenarios regarding their surgical experience, and researchers found that outcomes prioritized by hospitals and surgeons (e.g., length of incision) were not found to be important to most patients (63). Finally, a secondary analysis of a multicenter cluster-randomized trial of outpatients with serious illness found that 40% of clinicians were unsure of their patient's goals or did not perceive them correctly (66). Altogether, these findings suggest that misalignment of clinician and patient goals is common.

Of the 58% of prehabilitated patients who achieved their surgeons' referral aim, 95% had goals that aligned with their surgeons. Other studies have shown that when patients and clinicians collaborate to set health goals that are meaningful and achievable for the patient, attainment of clinical outcomes improves (e.g., adherence to treatment, improved complications, and fewer costs) (67-70). For example, a meta-analysis of 48 studies of patients without psychiatric illness evaluated whether physician-patient collaboration influenced patient adherence to prescribed treatment regimens and found that better physician-patient collaboration was associated with improved patient adherence across pediatric and adult populations, chronic and acute conditions, and both primary physicians and specialists (68). Furthermore, a large meta-analysis of mixed study designs assessed the impact of physician communication on patient treatment adherence and found that effective physician communication was associated with a 19% lower risk of patient nonadherence, and training physicians in communication skills significantly improved the odds of patient adherence by 1.62 (95% CI: 1.38, 1.91) (71). Finally, a systematic review of 26 studies involving 377 cancer patients who received preoperative prehabilitation interventions, and the 207 healthcare providers involved in their implementation, identified six themes that affected successful implementation; reflective motivation, such as

individuals' perceptions of prehabilitation and their impact on decision-making and goal setting, was the biggest perceived barrier/facilitator in promoting active participation (represented by 42% of respondents) (72). These findings support our study's results on using goal setting as a means of achieving clinician aims.

When patients actively participate in decision-making about their care, it has been found to enhance their satisfaction with the healthcare experience (73-79). A cross-sectional survey of 3,000 cancer survivors found that higher PAM scores were associated with significantly better outcomes and patient satisfaction in multivariate analyses. In fact, patients with high activation were 9 times more likely to feel their treatment aligned with their values, 4.5 times more likely to cope with side effects, and nearly 3.3 times more likely to adopt a healthier diet compared to less activated patients. The less activated patients were less likely to understand their diagnosis, adhere to treatment regimens, and be satisfied with their care (73). Interestingly, we did not find that PAM was associated with achieving the surgeons' referral aim. This contradictory finding might suggest that activation alone without involvement in the decision-making process is insufficient to modify outcomes. A systematic review of surveys from 504 cancer survivors, similarly found that PAM scores were significantly associated with treatment planning when it aligned with patients' goals and values ($p < 0.001$), which enhanced treatment adherence ($p = 0.011$) and satisfaction ($p < 0.001$); therefore this might demonstrate that while patient activation is crucial for effective self-management, when combined with active decision-making support, better outcomes are realized (80).

### 4.2. Study implications and future directions

The observed discrepancies between patient-reported goals and clinician aims (both surgeon referral and clinic outcome measurement) suggest that the patient orientation of the surgical prehabilitation pathway could be improved (81). Future research should focus on developing strategies to better align these goals, considering broader aspects of patient well-being and measurement of outcomes that are meaningful to patients (such as mental health and sleep quality). Our findings suggest that this patient-clinician goal alignment could promote the attainment of desired outcomes.

### 4.3. Strengths and limitations

The findings of this study represent a single site under the Canadian health care system and thus may not be readily transferable across all countries and hospitals. However, by including a range of surgical indications, ages, and sex, our findings are representative of diverse viewpoints. The findings are also timely and relevant, as data were collected from an ERAS setting. To increase the study's credibility and dependability, strategies including memoing for reflexivity, detailed auditing, and peer review by a second researcher for trustworthiness were implemented (26). A significant limitation of this study is its retrospective design, as reliance on pre-existing records inherently carries constraints on the data's breath and completeness and thus capacity for answering our research questions. While direct patient quotes were utilized, member checking could not be performed; thus, there is a possibility that the coding of these statements may not fully align with the patients' intended meaning. Additionally, we were limited to the referral aims listed on the referral form, which were vague and not associated with defined outcomes. As such, we made a priori assumptions (Supplementary Table 2) that could have

limited the integration of the qualitative and quantitative components; however, this was mediated by using multiple investigators to compare interpretations and establish agreement. Future research should consider these limitations and employ a prospective design to facilitate more reliable and generalizable findings.

## 5. Conclusions

This mixed methods study of patient goals and its alignment with clinician priorities in a prehabilitation setting supports existing literature on the usefulness of patient-oriented care and its benefits. A novel contribution is the exploration of this alignment on achievement of surgeon referral aim.

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## BRIDGING STATEMENT

The first manuscript addresses the three outlined objectives of my MSc Thesis, which is to explore the alignment between patient goals and clinician expectations in a prehabilitation program and determine how this alignment impacts patients' success in achieving referral outcomes. We identified common patient goals, such as improved physical health and readiness for surgery, and assessed their alignment with surgeon priorities. These findings are a first step toward understanding how goal alignment can enhance the effectiveness of perioperative care.

The following letter addresses the final objective of this MSc Thesis, which was to revise POP's Patient Engagement Handout, a decision aid for enhancing patient engagement and satisfaction in the prehabilitation process, based on patient input. This prospective qualitative data collection and analysis aimed to understand how patients perceive the handout, its usefulness, and impact. This letter contributes insights into refining engagement tools to better support patients in aligning with their preoperative care goals.

## 4. LETTER

**Article Title**: Evaluating patient perspectives on an engagement tool for prehabilitation

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**ABBREVIATIONS**

**POR**: Patient-Oriented Care; **MGH**: Montreal General Hospital; **POP**: Peri-Operative Program; **PAM**: Patient Activation Measure; **NGSE**: New-Generated Self-Efficacy; **SOC**: Sense of coherence

To the Editor:

Patient engagement is essential in patient-centered care (POC), where patients are viewed as active partners in their care journey. Engagement occurs on a continuum from informing to empowering, meaning the partnership includes patients as assets to every stage of the care process but respects the level of engagement desired by the patient (1-4). By involving patients in the decision-making process, through tools like pamphlets, videos, or web-based resources, healthcare providers can help reduce uncertainty, encourage active decision-making, and enhance patient satisfaction with their care (5).

To engage patients in the PeriOperative Program (POP) at MGH, a Patient Engagement Handout (Supplementary Figure 1) was co-developed with a patient partner to support shared decision-making. This handout serves as a decision aid, helping to reduce decisional conflict and enhance patient satisfaction by actively involving patients in their care. From September 2022 to September 2023, all patients consecutively enrolled in POP completed this handout. The POP program utilizes prehabilitation to prepare patients for surgery; a proactive approach that enhances a patient's functional capacity through exercise, nutrition, and psychosocial support before surgery, aiming to improve recovery and reduce complications (6-8).

We recently conducted a retrospective review of this Patient Engagement Handout to explore whether aligning patient goals with clinician expectations can improve attainment of clinician objectives. For the present prospective study, we explored how patients perceive the current Patient Engagement Handout. These findings could be useful to modify the existing tool to maximize engagement and enhance patient satisfaction. Semi-structured qualitative interviews were conducted to ask patients about their experiences with the handout, including its clarity,

usefulness, and impact on their engagement with the prehabilitation program (Supplementary Table 1).

Data were analyzed by KB using summative content analysis (9, 10). Deductive (i.e., pre-specified) coding (Supplementary Table 2) was used to identify and define specific keywords (e.g., "recalls handout") from the interview transcripts for analysis (11). After the analysis, responses were organized into a concept map to help visualize and connect the data (Supplementary Figure 2). This process, as outlined by Kleinheksel (10) and Hsieh (9), involved several steps and has been described previously (9, 12).

Patients who successfully completed their prehabilitation program at the POP clinic were included in this qualitative study between February 2024 to April 2024. There were no exclusion criteria. Data saturation was reached at 9 patients and 11 were interviewed in total (13).

Participants (n=11) included surgical patients receiving treatment for hernia (HR, n=5), upper gastrointestinal (UGI, n=3), lower gastrointestinal (LGI, n=1), lung (LNG, n=1), and spine conditions (SPINE, n=1). Participants were 55% (n=6) female with a mean age of 61 years (standard deviation:9.4 years). The average Patient Activation Measure (PAM) score at the time of interview was 72/100 (sd: 13), indicating a high average activation level (Level 4/4). Four main categories were identified from semi-structured interviews: 1) Recall of the handout, 2) recall of goals and progress, 3) personal thoughts on the engagement handout, and 4) a "teamwork agreement" strategy to promote engagement. Each category was organized with sub-categories as appropriate.

### 1. Patient Engagement Handout

Patient responses gave an overall impression that the implementation of the engagement handout needs to be improved. Treating the engagement handout as another baseline form could

hinder the engagement process, reducing its impact, not being memorable, and resembling routine paperwork rather than a meaningful tool. Of the 11 participants, 7 did not remember filling out the handout at baseline, with 2 participants expressing paperwork feels burdensome, and identifying that the form was not filled out by themselves but the staff. Of the 4 participants that recalled filling out this handout at baseline 2 did so vaguely. These findings suggest that some of the completed tools may not reflect patients' actual goals (when given too much assistance by staff) and that the handout needs to be presented in a more impactful manner to promote engagement.

*This isn't my writing… I refill the same things so often… it's like a punishment -UGI33*

*This was not my goal; this was their goal -UGI139*

*Yeah…vaguely, I remember. -GI72*

*Yeah… I don't remember exactly what's on it. -SPINE29*

**2. Engagement Handout Goals**

***Did you meet your goal(s)?***

Five participants felt that they accomplished at least one of their goals and appeared to be satisfied with their progress. The remaining 6 patients expressed feelings of no accomplishment or wished they could do more. None of the participants felt they met all their stated goals. This could be because patients are not familiar with goal setting and can easily under- or overestimate their abilities within the short pre-surgery prehabilitation timeframe. Having their goals evaluated by clinicians after the handout is completed may allow for a collaborative discussion to ensure goals fit within the SMART (Specific, Measurable, Achievable, Relevant, Time-Bound) criteria (14).

*I'm rather pleased with what I've attained and accomplished so far. I've surprised myself. And now I'm only more and more motivated to because I see the light at the end of the tunnel. -UGI133*

*Going into it, I had prayed that I would stop smoking. I'm 52, I've been smoking for a very long time, and I haven't had a cigarette since the end of November [2023]. So that's good for me. So, yes, that goal was my ultimate goal, and I feel like I conquered that. -HR112*

*I wish that I could have done more with the physio myself to make myself stronger, but it was blocked because of the pain and because of the [acid]. The regurgitation. -SPINE29*

***Would you change your goals?***

Three patients wished to amend their goals after having experienced the prehabilitation pathway. They did so by describing additions to their existing goals or having a brand-new goal. Eight participants did not wish to change their goals. These respondents recognized their goals as attainable or appeared to be very pragmatic during their time in the program. Other respondents maintained their original goals because they still wished to achieve them.

*I knew something needed to be done… I didn't know [what to eat] before surgery- that I need to increase the muscle mass. I knew that I need to lose a bit of weight and lose fat, but not really increase muscle mass. It's not something I would think about. -GI72*

*It's two [goals] now. My first goal is to be for the surgery to go well. To be able to recuperate properly. And the second part will be to live a longer life. -HR111*

*I would like to be a little bit more positive. -UGI32*

### 3. Engagement Handout Comments

*What did you like about this Engagement Handout?*

Overall, participants appreciated the concept of shared decision making. The components of the handout they liked included its ability to engage patients, its simplicity, and that it showed how the pillars of POP link together.

> *I don't remember it, but it seems to be a good benchmark. It's good to get the process going. I think it's a good idea. -HR111*
>
> *Visually is everything, right? It's like putting in a diagram or adding lines to it to say that everything that you shared in top left, right, bottom left, right actually comes into the center for the common goal. That could be good that they're all linked together. But I think that those questions are great, and it contributes to the one word in the middle that like is the end all have all. Like, okay, so where are we going with this? Yeah, connecting it like a diagram is good. -HR112*

*How can this Engagement Handout be improved?*

Participants suggested the handout could be improved by providing space for them to list their barriers (i.e., a designated area to write their barriers to adherence), being more visual, recording progress throughout the program, allowing privacy while the form is filled, and leaving space for patients to write as much or as little as they would like. Those who wished to record their personal roadblocks (n=5) felt they needed space to voice adversities or barriers that could prevent them from adhering to the program, such as challenges to mental health. Those who recommended making the handout more visual (n=4) suggested revisions or updates could be made at each appointment. Two respondents suggested that the handout be filled alone by patients before they have been given any instruction by the clinician so they can utilize the time

and space to think deeply of their personal goals without influence. Some patients had trouble filling out the mental and medical components for this very reason. Given that some participants shared their dislike for filling medical forms and writing in general, while others made comments suggesting more writing space would be helpful, the handout should incorporate either option to accommodate all needs. These proposals suggest that patients may respond well when given the space to write as much or as little as they want, and with clear understanding that there are no right or wrong answers.

*It should be a living document of your journey… You can make modifications every time and discuss it -HR111*

*Give people privacy and time to adjust -LNG32*

*More space to write -HR131*

4. **Teamwork Agreement**

Per the suggestion of a study participant, the idea of a "Teamwork Agreement" was proposed, where both the patient and clinician sign the engagement handout as equally participating and responsible members to encourage and motivate patients. Four participants thought this would be a good, while others were not explicitly convinced a signed agreement would make a difference for all patients. This suggests that other methods of patient engagement and motivation should be explored that are adaptable to individual levels of engagement.

*It is 100% better with teamwork" -UGI32*

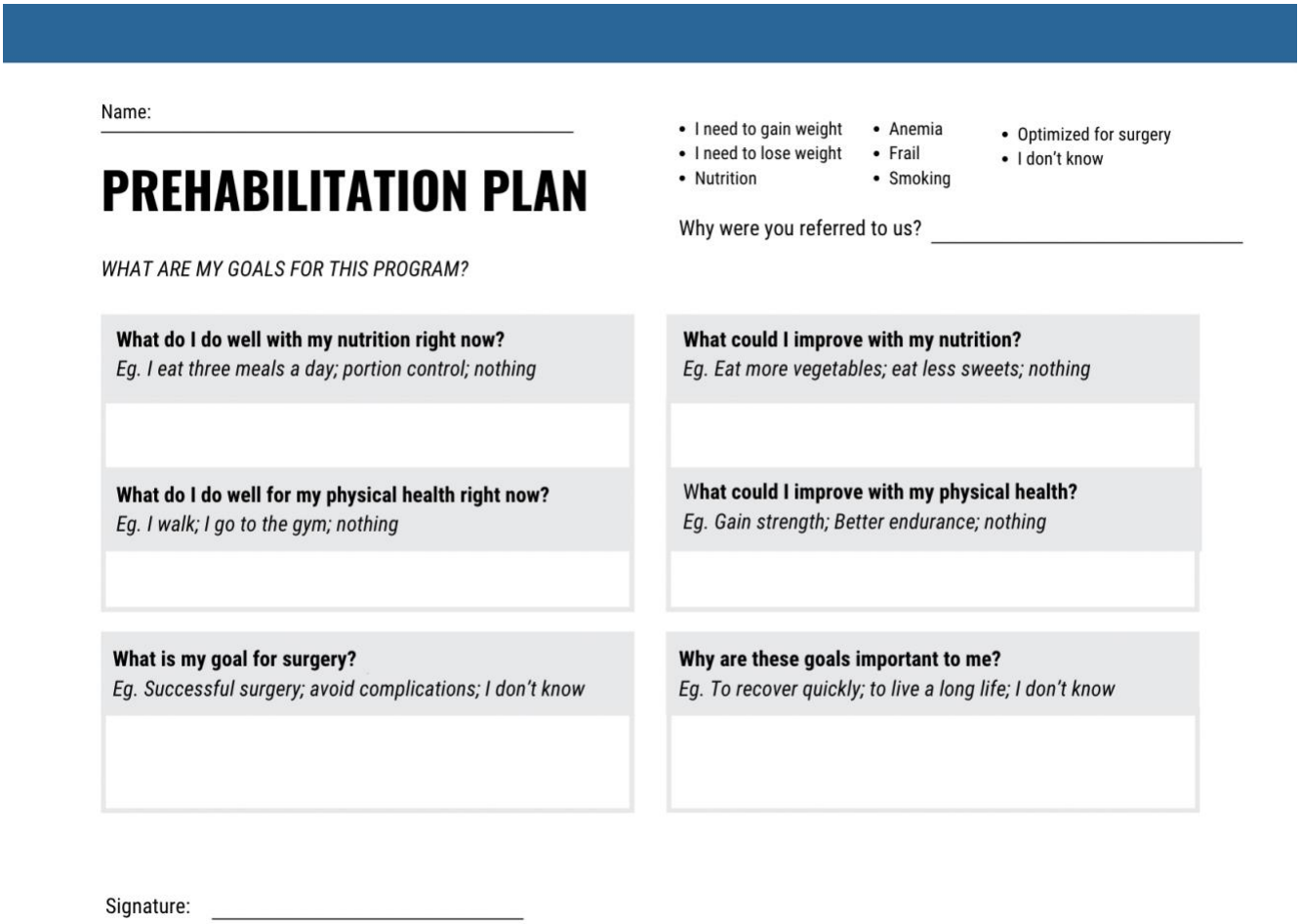
In response to the findings of this study, an updated patient engagement handout has been preliminarily designed to better align with patient needs and goals (Figures 1 and 2) and should be tested in future studies.

To enhance patient engagement, we recommend that the handout is filled independently by the participant, reviewed by clinicians to provide realistic expectations/ encouragement, and be updated at each clinic visit to remind patients of their goals and highlight progress.

A limitation of this study is that most patients were interviewed post-surgery, and their responses may reflect their current condition, including pain and decreased functional capacity, rather than their preoperative prehabilitation experiences.

In conclusion, by addressing patient needs and preferences, the POP prehabilitation clinic may enhance its standard of care to promote a more patient-centered environment.

**Figure 1.** Revised patient engagement handout based on results of this study. The first page titled "Prehabilitation Plan" details the patients perceived reason for referral (i.e., why they are at the prehabilitation clinic), their current nutritional as well as physical strengths and weaknesses, and their goal for surgery and the rationale for the goal. A range of examples are provided for the patients, so they can write their initial responses themselves. This page is filled at baseline before any instruction or counseling is given and is kept as a reminder for the patient and clinicians of the goals that have been set.



Name: _____

# PREHABILITATION PLAN

- I need to gain weight
- I need to lose weight
- Nutrition
- Anemia
- Frail
- Smoking
- Optimized for surgery
- I don't know

Why were you referred to us? _____

*WHAT ARE MY GOALS FOR THIS PROGRAM?*

**What do I do well with my nutrition right now?**
*Eg. I eat three meals a day; portion control; nothing*

**What could I improve with my nutrition?**
*Eg. Eat more vegetables; eat less sweets; nothing*

**What do I do well for my physical health right now?**
*Eg. I walk; I go to the gym; nothing*

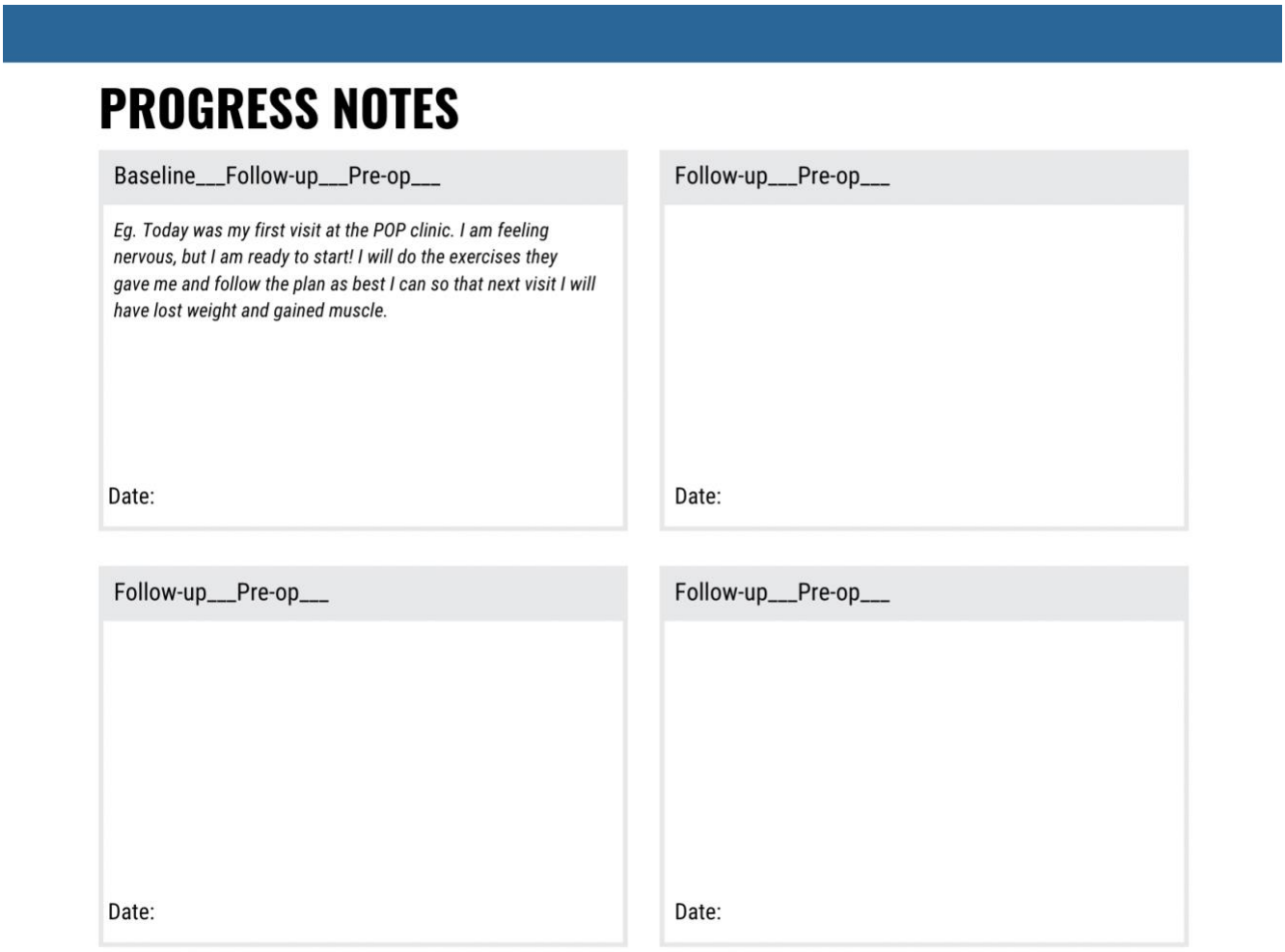
**What could I improve with my physical health?**
*Eg. Gain strength; Better endurance; nothing*

**What is my goal for surgery?**
*Eg. Successful surgery; avoid complications; I don't know*

**Why are these goals important to me?**
*Eg. To recover quickly; to live a long life; I don't know*

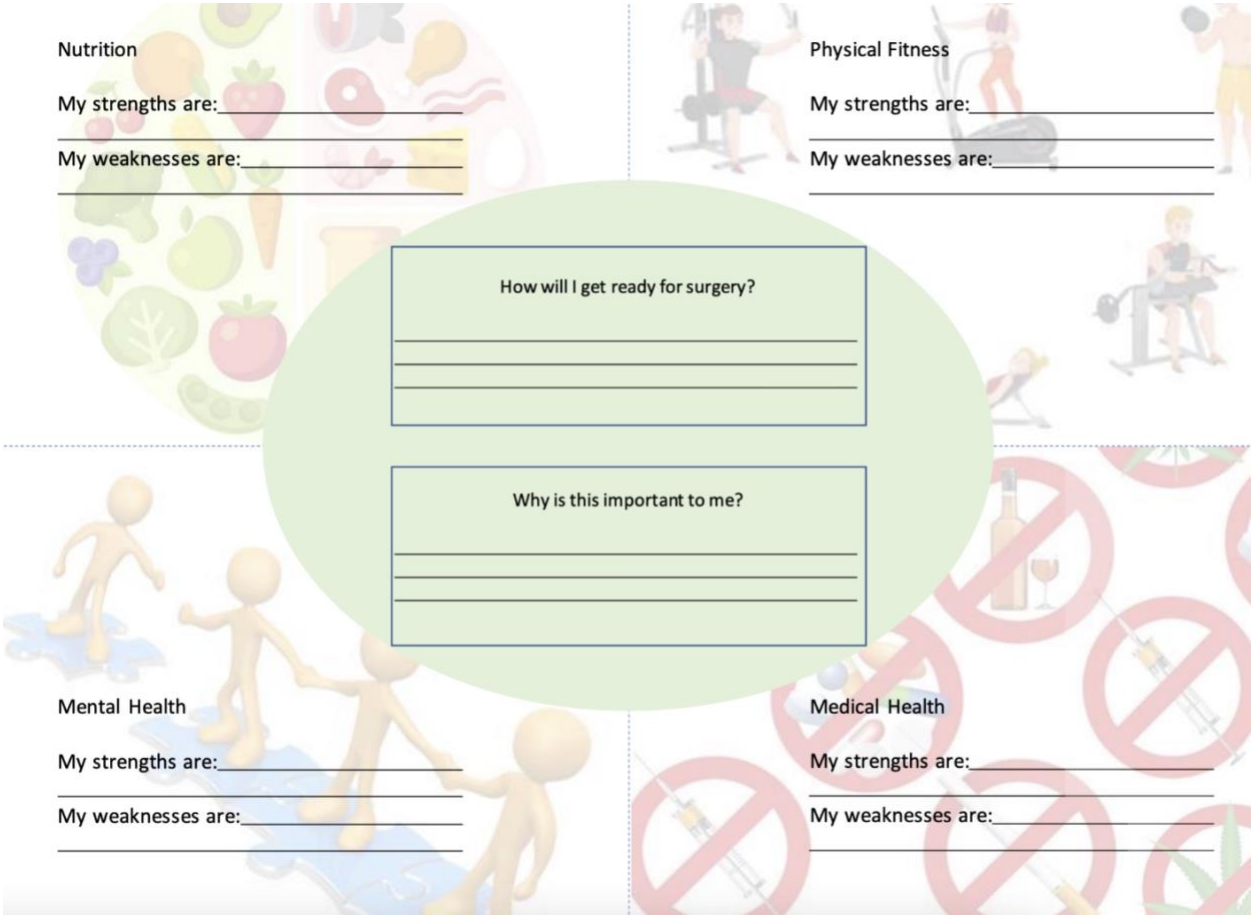
Signature: _____

**Figure 2.** Second page of the revised patient engagement handout. Titled “Progress Notes”, this page will be updated at baseline and each follow-up appointment where the patient will write their feelings and accomplishments from the last visit.



**SUPPLEMENTARY**

**Figure 1.** Original Patient Engagement Handout designed with a patient partner. The Engagement Handout highlights the four cornerstones of prehabilitation: nutrition, physical fitness, mental health, and medical health. Patients are invited to explain their strengths and weaknesses regarding these 4 components and then use this information to develop a goal to prepare for surgery along with why this preparation is important to them. The purpose of this handout is to gain perspective on patient goals and level of self-awareness of their perceived strengths and weaknesses to promote program adherence.



**Supplementary Figure 2**. Concept mapping of 11 semi-structured patient interviews. The participant responses are organized into three categories (handout recall, goals, and general comments') with the Teamwork Agreement included where relevant. Patient IDs are connected to the respective responses and lines have been drawn connecting themes touched on by multiple participants.

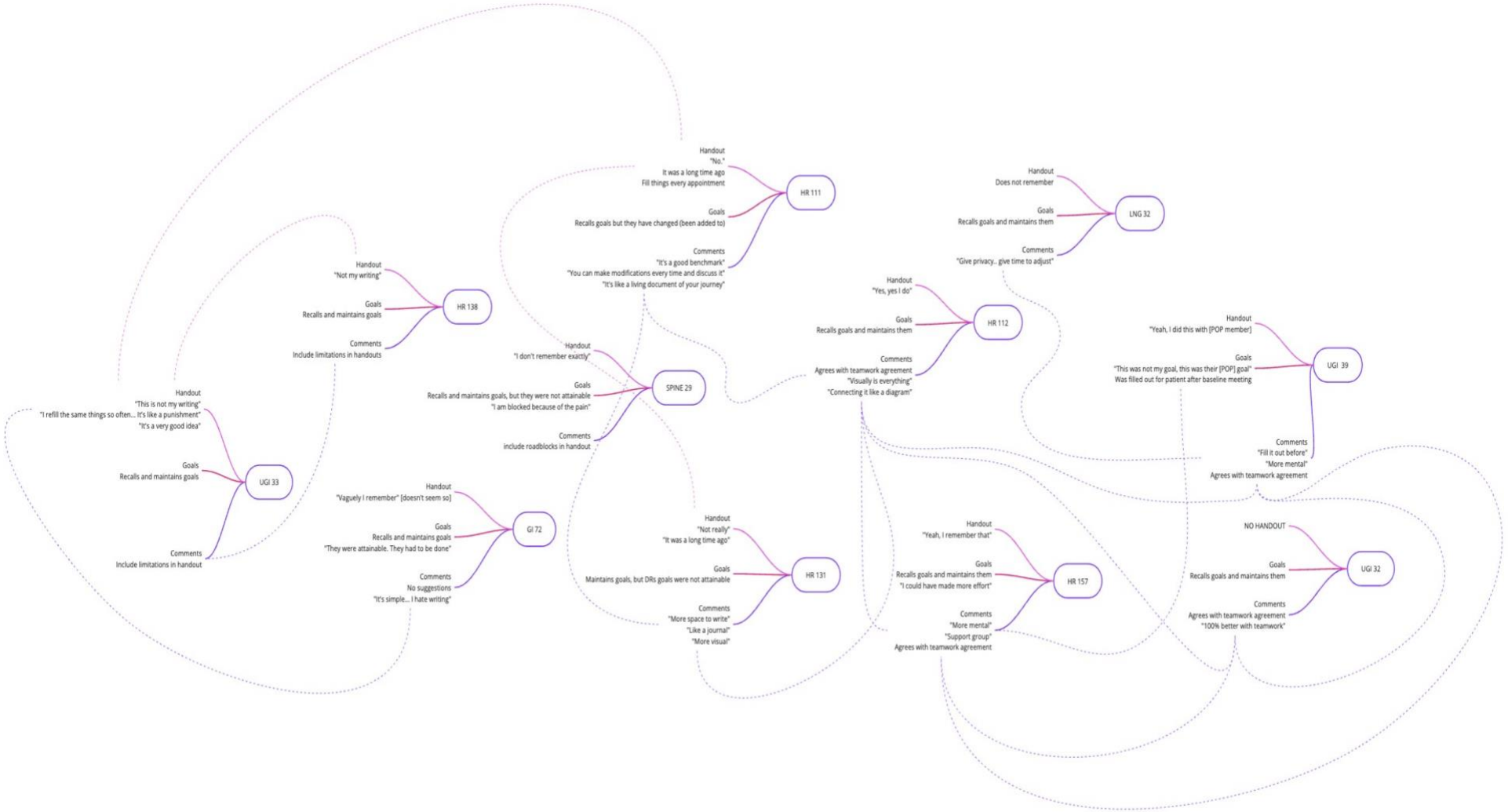


**Table 1.** Semi-structured interview questions

| Interview questions |
| --- |
| Do you remember filling this out? |
| Do you remember what your goal was? |
| Did you meet the goal you set for yourself? |
| How did the POP clinic contribute to your goal? Could this have been improved? |
| What do you think about your answers now compared to the beginning of the program? (e.g., Thinking about the goal throughout, was it an attainable goal, would you change anything about your goal?) |
| What was the goal that the clinic set for you? (e.g., What did you think about it? Did it align with your goal for yourself?) |
| Is there anything you like or dislike about the goal handout itself? (e.g., Is it worthwhile? How is the wording? How do you feel about the way it's used?) |
| What do you think about the training materials provided by POP? (e.g., How did you use them? How did you find them visually?) |
| What would you think about a "teamwork agreement" that clearly explains the expectations for the clinic and for the patient before you start the program? (e.g., Would this be helpful?) |

**Table 2.** Coding scheme used in Nvivo software to organize interview responses.

| Category | Subcategory | Codes |
|---|---|---|
| Engagement Handout Recall | I recall this Engagement Handout | Recall vaguely |
| | | Recall completely |
| | I do not recall this Engagement Handout | Too much time has past |
| | | Dislike paperwork in general (all blurs together) |
| Goal Recall and Progress | I met my goal | Feel accomplished with at least one goal |
| | I did not meet my goal | Do no feel accomplished with any goals |
| | I would change my goal | Add new goal |
| | | Modify existing goal |
| | I would not change my goal | Accomplished already |
| | | Still hopes to accomplish |
| Personal Thoughts on Engagement Handout | Pros on Engagement Handout | Simple |
| | | It ties themes of POP together |
| | | Engages patients |
| | Cons on Engagement Handout | Designate area to write their personal barriers to adherence |
| | | Be more visual |

| | | |
|---|---|---|
| | | Record progress throughout the program |
| | | Allow privacy while the form is filled |
| | | Leave space for patients to write as much or as little as they would like |
| Perception of Teamwork Agreement | Idea resonates | Useful strategy to promote adherence |
| | Idea does not resonate | Not a useful strategy |

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# 5. DISCUSSION

This discussion is divided into several components to synthesise our findings within the context of the current literature. A summary is provided first to emphasize our key findings. The subsequent sections reflect on these findings considering the Triple Aim, future research directions, recommendations to improve the standard of practice in healthcare and concluding with strengths and limitations.

## 5.1. Summary of findings

Our mixed-methods study investigated the strengths, weaknesses, and goals of patients undergoing prehabilitation for surgery, revealing that while patients prioritized physical health, surgical preparedness, and nutrition, these latter goals were often neglected in clinical assessments. Surgeons typically referred patients for optimizing surgery readiness, smoking cessation, and managing extreme BMI levels. Crucially, alignment between patient and surgeon goals was the strongest predictor of successful prehabilitation outcomes, underscoring the need to align goals to enhance the effectiveness of prehabilitation and improve surgical results.

### 5.1.1. The Triple Aim

By examining the nuances of patients' goal achievements through both quantitative and qualitative lenses, we aimed to improve clinical practice in a way that aligns with the Triple Aim framework (72, 165). This healthcare framework is designed to optimize the performance of health systems by focusing on three key objectives: improving patient experience of care, enhancing the health of populations, and reducing the per capita cost of healthcare (72). Each component of the Triple Aim is addressed below through the insights gained from this study.

#### 5.1.1.1. Improving patient experience

Our mixed methods study found that merely one third of the preoperative goals for patients in a prehabilitation program *completely* aligned with their surgeons. Our findings indicated that among 237 differing rationales for preparing for surgery, primary motivations for patients' goals were focused on themselves, the desire to recover, and the wellbeing of family and friends. Similarly, when patients undergoing abdominal surgery in an international, multicenter qualitative study (n=30) described what they considered a successful recovery, they did not mention clinical outcomes like early discharge (166); in fact, the five overarching themes identified were: returning to habits and routines, resolution of symptoms, overcoming mental strains, regaining independence, and enjoying life. Yet, clinician-oriented outcomes continue to dominate the literature, according to a recent scoping review of 76 surgical prehabilitation trials (167). These findings suggest that while clinician-oriented outcomes remain important, patient-reported outcomes are insufficiently addressed. According to the Triple Aim, if we want to provide high quality care, we should focus on improving the patient experience, and this starts with prioritizing its measurements.

When communication between the patient and clinician is prioritized, patient experience and satisfaction increases. A systematic review and meta-analysis of 27 studies involving clinicians in primary care and rehabilitation settings identified 129 verbal, nonverbal, and interaction style factors, finding that 38 factors consistently correlated (weakly) with patient satisfaction, particularly verbal involvement and support ($r \geq 0.21$), with a moderate association observed between caring interaction styles (pooled $r = 0.51$, 95% CI 0.42 to 0.60), emphasizing the importance of clinician communication in enhancing patient experience and satisfaction (157). Additionally, a systematic review involving 31,043 patients who received usual care

evaluated the impact of decision aids (e.g., pamphlets, videos, web-based tools) in healthcare and found these aids increased participants' knowledge, the accuracy of risk perceptions, and congruency between informed values and care choices compared to usual care alone; the results indicated that the aids reduced decisional conflict, passive decision-making, and improved patient satisfaction with the decision-making process (156).

#### 5.1.1.2. Enhancing health of populations

When adhered to, prehabilitation interventions can play a crucial role in enhancing patient outcomes by minimizing the risk of postoperative complications (36, 96, 168). Aligning patient goals with appropriate interventions can ensure that patients are effectively triaged to the correct level of care, and by personalizing treatment to these goals, patients may be more motivated to adhere to the prescribed interventions. For example, a systematic review of 10 prospective clinical trials found that patient engagement interventions (e.g. personalized medicine) for adults with chronic diseases led to increased motivation and improved clinical disease markers, highlighting the importance of incorporating patient motivation and engagement to improve outcomes (169). By optimizing prehabilitation adherence, through supporting patients in achieving their health objectives, these programs can potentially reduce the global burden of postoperative complications, permitting patients to be discharged earlier to return to their families and work lives. (170).

#### 5.1.1.3. Reducing costs

By aligning patient goals with evidence-based clinical practices, healthcare systems can effectively manage resources and reduce overall healthcare expenditures, thereby contributing to

the Triple Aim's goal of reducing healthcare costs while maintaining quality care (72, 147, 148). By explicitly identifying and addressing individual goals, thereby fostering direct and meaningful engagement with patients throughout their care journey (11). For example, a retrospective analysis of Veterans Health Administration (VHA) data assessed the efficacy of care coordination home telehealth (CCHT), a program that implements various behaviour change techniques (e.g., individualized goal setting, self-monitoring, feedback and reinforcement, education, problem-solving and action planning, social support and communication, and skill development), for 4,999 patients with chronic conditions compared to a matched cohort of 183,872 veterans receiving usual care, finding that after 12 months, CCHT patients had a 4% reduction in annual healthcare costs (from $21,071 to $20,206), compared to a 48% increase for the usual care group (from $20,937 to $31,055), along with lower mortality rates (9.8% vs. 16.58%) and better medication compliance (148). Additionally, in an observational study of the same telehealth program sampled 17,025 veteran patients and found a 25% reduction in bed days of care, a 19% reduction in hospital admissions, and an 86% patient satisfaction rate, with the cost per patient being $1,600 annually (147). These examples, while outside of surgery, demonstrate that aligning patient care with personalized goals can significantly enhance both cost-efficiency and patient outcomes.

### 5.1.2. Future directions

The study's focus on understanding patient goals directly aligns with the Canadian Institutes of Health Research (CIHR) priorities regarding patient engagement (171). CIHR emphasizes the importance of involving patients in the development and evaluation of healthcare services to ensure that these services are responsive to their needs and preferences (172). CIHR

also encourages knowledge translation, which involves applying research insights into clinical settings and exemplifies how research can drive practical improvements, ensuring that advancements in clinical care are grounded in real-world evidence and benefit both patients and healthcare providers (173). To begin to mobilize knowledge from our study into practice, suggestions for healthcare practice and research are detailed below.

#### 5.1.2.1. Improving healthcare practices

Incorporating goal setting and shared decision making into logic models (174) may further refine the effectiveness of prehabilitation programs by systematically including and addressing patient-specific objectives directly within the framework (175). Logic models provide a visual framework for understanding a program's operation and are essential in planning, implementing, and evaluating programs (175-177). Logic models help stakeholders understand the relationship between program components like goals, activities, and outcomes. They also ensure that everyone involved is working towards the same clearly defined outcomes. By including goal setting and shared decision making in a logic model for prehabilitation, patient goals will be systematically mapped out alongside program activities (176). This alignment would not only clarify how each activity contributes to achieving patient-specific outcomes but also facilitate the measurement of progress towards these goals. Applying goal-setting principles within logic models could also help in identifying patient-oriented key performance indicators and evaluating the impact of prehabilitation interventions on these indicators (176).

#### 5.1.2.2. Improving research practices- SMART goals and BCTs

This thesis suggests that harmonizing patient and clinician goals within prehabilitation programs could enhance clinical outcomes. Future research should explore strategies to bridge this gap. Collaborative goal-setting frameworks, like the SMART criteria (Specific, Measurable, Achievable, Relevant, Time-bound), could be tested prospectively to determine whether this strategy improved communication and engagement between patients and clinicians (164), and whether this strategy improved patient outcomes. Investigating the application of goal setting approaches in prehabilitation could help align goals more effectively, ultimately tailoring interventions to better meet individual patient needs and preferences, improving adherence to the program. Ultimately, excellent adherence to the prehabilitation program could enhance clinical outcomes such as length of hospital stay (96).

Future research should also incorporate standardized behaviour change techniques referenced in the BCTv1 taxonomy, noting the specific techniques applied and the outcomes measured (58). By reporting BCTs we can begin to understand which interventions work best and for whom.

## 5.2. Strengths and limitations

The findings of this study are drawn from a single site within the Canadian healthcare system, limiting their direct applicability to other countries and healthcare settings. However, the inclusion of a diverse range of surgical indications, ages, and sex ensures a broad spectrum of perspectives. Data collection in an Enhanced Recovery After Surgery (ERAS) setting underscores the timeliness and relevance of our findings. To bolster the study's credibility and dependability, we employed strategies such as reflexive memoing, and peer review by a second

researcher – all key quality strategies outlined in the Cochrane Critical Appraisal of Qualitative Research guidelines (92).

The retrospective portion of this study inherently relies on pre-existing records, which may affect the completeness and accuracy of the data. This design choice potentially limits the accuracy and thoroughness of the findings, as the study was unable to control or standardize data collection processes from the beginning. Although we incorporated direct patient quotes, the inability to perform member checking introduces the possibility that the coding of these statements may not entirely capture the patients' intended meanings. Moreover, our analysis was confined to the referral aims noted on the referral forms, which were often vague and not linked to specific, predefined outcomes. Consequently, we had to make a priori assumptions, which might have hindered the integration of the qualitative and quantitative components of the study. However, this issue was mitigated by involving multiple investigators in the process to compare interpretations, which was found to have excellent agreement, and in reaching a consensus. Going forward, future research should take these limitations into account and opt for a prospective study design, which would likely yield more reliable and generalizable results.

## 6. CONCLUSION

This exploration of patient-centered, goal-oriented approaches to surgical and perioperative care emphasizes the need to reconcile patient and clinician objectives. Traditional clinician-oriented metrics, while critical for assessing measurable outcomes such as postoperative morbidity and mortality, often fall short in addressing the nuanced and individualized goals that are meaningful to patients, especially those with complex health

conditions. This disparity highlights the importance of integrating a holistic view that considers not just the disease-oriented but also the social and functional dimensions of patient health.

Adopting a patient-centered model facilitates a more comprehensive understanding of realistic patient expectations and devises strategies tailored to meet these expectations. This approach acknowledges the broader spectrum of patient needs, encompassing symptom relief, functional improvement, and the restoration of social roles and interactions. Such a paradigm shifts from a predominantly disease-oriented medical care, which typically focuses on short-term outcomes like hospital length of stay, readmission rates, and immediate postoperative morbidity and mortality, to a more inclusive patient-oriented model, can significantly enhance patient satisfaction and experience. Moreover, as highlighted in this research study, this approach can also support patients to meet their surgeons' referral aim.

Several studies have shown a notable discrepancy between the treatment priorities of patients and carers versus those pursued by researchers. For instance, drug treatments, which constitute a significant portion of clinical trials, represent a smaller fraction of the priorities identified by patients. Likewise, our findings suggest that the outcome measures of the PeriOperative Program met 44% (n=12/27 sub-categories) of patient goals. This misalignment underscores the necessity for research frameworks to be more attuned to the holistic needs and priorities of patients, thus fostering more relevant and impactful medical research.

In conclusion, the shift towards a patient-centered, goal-oriented approach in perioperative care and medical research could improve patient satisfaction, experience, and a range of health outcomes. Aligning goals between patients and clinicians could facilitate the achievement of both parties' objectives, ensuring that the needs of both patients and healthcare providers are effectively met.

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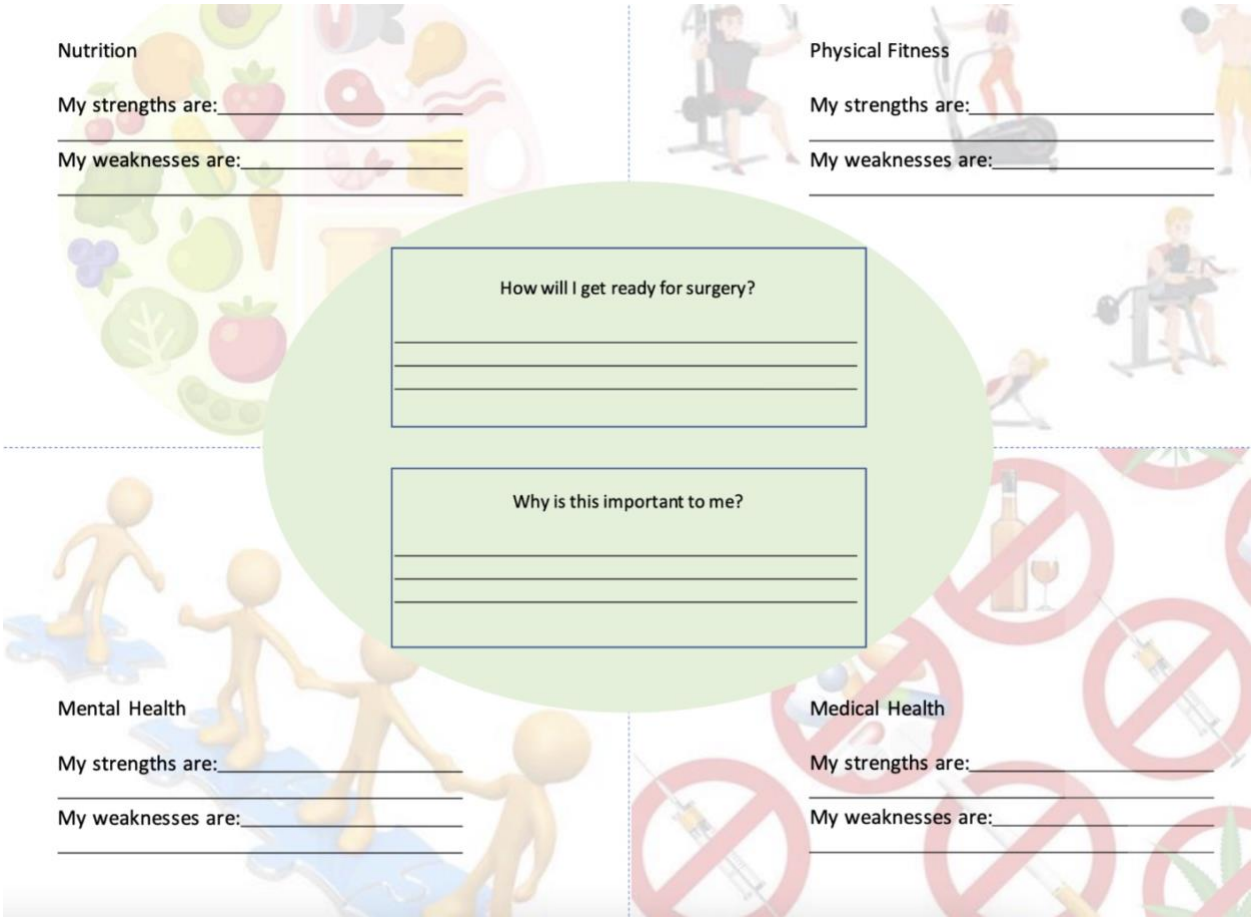
## 7. SUPPLEMENTARY MATERIALS

**Supplementary Figure 1.** Patient Engagement Handout developed at the PeriOperative Program (POP) with a patient partner. The handout summarizes the four pillars of POP (nutrition, physical fitness, mental health, and medical health) and asks patients to record strengths and weaknesses for each, as well as their goal for surgery (center top) and their rationale for said goal (center bottom).



**Supplementary Table 1.** Demographic and intervention outcomes collected pre- and post-surgery at the Peri-Operative Program prehabilitation clinic.

| Variables | Baseline | Post-MP | Definitions |
|---|---|---|---|
| Biological & Physiological Factors | | | |
| Demographics | | | |
| Age (y) | X | | |
| Sex | X | | |
| Active Smoker | X | | |
| Anthropomorphic Measures | | | |
| Height (m) | X | | |
| Weight (kg) | X | X | |
| Body Mass Index (kg/m2) | X | X | |
| Nutrition phenotype | | | |
| Fat-Free Mass (kg) | X | X | Measured by bioelectrical impedance analysis to assess malnutrition and cachexia |
| Fat-Free Mass Index (kg/m2) | X | X | Indexed to body surface area by dividing fat-free mass by the square of height in meters. |
| Patient-Generated Subjective Global Assessment | X | | Validated tool for diagnosing malnutrition and triaging need for nutritional support |

| | | | | |
|---|---|---|---|---|
| | Grip strength (kg) | X | X | Measures muscle function via hand grip dynamometer best value retained from bilateral testing. |
| Functioning | | | | |
| | 30-second Arm Curl Test (#) | X | X | Upper body strength measured by number of bicep curls in 30 seconds holding a hand weight (women 5 lbs, men 8 lbs). Best value retained from bilateral testing. |
| | 30-second Sit-to-Stand Test (#) | X | X | Lower body strength measured number of full stands in 30 seconds with arms folded across the chest |
| | Six-Minute Walk Distance (m) | X | X | Physical endurance (ability to maintain submaximal aerobic exercise) measured by maximal distance walked in six minutes |
| General Health Perceptions & Overall Quality of Life | | | | |
| | Health-Related Quality of Life | | | |
| | SF-36 Bodily Pain Scale | X | X | Measures patient-reported ability to live without limitations due to pain |
| | SF-36 General Health Perceptions Scale | X | X | Measures patient self-assessment of general health and impact of symptoms |

| | | | | |
|---|---|---|---|---|
| | SF-36 Mental Health Scale | X | X | Measures patient self-assessment of anxiety, depression, loss of behavioural/emotional control, and psychological well-being |
| | SF-36 Vitality Scale | X | X | Measures patient self-assessment of subjective well-being and impact of disease |
| | Mood Disorder Screening | | | |
| | Hospital Anxiety Depression Scale | X | X | Screening test for psychiatric disorder among non-psychiatric hospital patients |
| | Generalized Anxiety Disorder 7-item | X | | Screening test for generalized anxiety disorder for general population |
| Multimodal Prehabilitation Program Details | | | | |
| | Length of program (days) | | X | Number of days between baseline and post-prehabilitation assessments |
| | Overall Program Participation (%) | | X | Weighted average of percent completed exercise and nutrition components |
| | Exercise Supervision (Y/N) | | X | Exercise Intensity may affect efficacy of MP |
| Clinical Outcomes | | | | |

| | | |
|---|---|---|
| LOS | X | Measures length of stay in hospital in days from admission to discharge |
| Readmission | X | Measures days of readmission to hospital after discharge |
| Complications | X | Measures any complication graded with Clavien-Dindo and stratified by severity (Clavien-Dindo >=3) |

Table adapted from Dr. Janius Tsang's thesis "Successful Multimodal Prehabilitation Prior to Elective Colorectal Cancer Resection: A Recursive Partitioning Analysis of Pooled Trial Data" (178).

**Supplementary Table 2.** Summary of the 13 reasons surgeons refer patients to the PeriOperative Program (POP) and pre-determined criteria for establishing successful attainment of referral aim for 192 prehabilitated patients.

| **Referral reason extracted from Referral Form** | Frail/ Deconditioned | Low albumin <35 | HbA1c > 8% | BMI < 18 or >40 | High medical risk | Neoadjuvant therapy | Smoker | Major surgery | Unintentional weight loss | Anemia | Poor nutrition | Evaluation/ Optimization | Help patient lose weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n (%) | 6 (13.6) | 4 (2) | 4 (2) | 55 (28.8) | 31 (16.2) | 32 (16.8) | 63 (32.98) | 73 (38.2) | 14 (7.3) | 17 (8.9) | 4 (2) | 14 (7.3) | 9 (4.7) |
| Definition of achievement | Preoperative improvement in 6MWT of at least 19m or more | Preoperative improved albumin >35 or PGSGA status change (improvement from B to A or C to B/A) or if numerical score improved by 4 or reached cut-point of PG-SGA < 4 | Hba1c improvement from baseline level of < 8% to > or = to 8% | Preoperative change of 5% or more, weight loss or BMI less than 40kg/$m^2$ or over 18 kg/$m^2$ | Any complications within 30-d post-surgery are avoided or non-serious (Clavien Dindo <=3) | Any complications within 30-d post-surgery are avoided, PGSGA status change (improvement from B to A or C to B/A) or if numerical score improved by 4 | Any improvement in smoking cessation status (decreased frequency or stopped) | Any complications within 30-d post-surgery are avoided or non-serious | Preoperative stabilization in weight (i.e., not decreasing) or any weight increase | Increased ferritin or Hb>130 compared to baseline | PGSGA status change (improvement from B to A or C to B/A) or if numerical score improved by 4 or reached cut-point of PG-SGA <4, or physical | Any preoperative improvement in the following measurements: 6MWT improved by 19 or more, PGSGA status change (improvement from B to A or C to B/A) or if | Preoperative loss of 5% body weight (if BMI >40), or change to BMI <40 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | or reached PG-SGA cut-point of <4, and 6MWT improvement of at least 19m or more | | | | | markers improve (FFM or weight increase or decrease depending on baseline assessment) assessment, improvement in 6MWT of at least 19m or more) | numerical score improved by 4 or reached cut-point of PG-SGA < 4, FFM gained >1kg, FM loss of >1kg | |
| Legend | **PG-SGA is patient-generated subjective global assessment (malnutrition assessment); HbA1c is glycated hemoglobin (average glucose levels); 6MWT is six-minute walk test (functional capacity measurement); BMI is body mass index, FFM is fat-free mass (derived from bioelectrical impedance and inclusive of muscle); Hb is hemoglobin (blood hemoglobin content).** | | | | | | | | | | | | |

**Supplementary Table 3.** Results of chi squared test showing number of patients (n), proportion of patients (%), p value, and kappa statistics.

| **All patients** | **n=191** | | | |
|---|---|---|---|---|
| | n | **%** | **P value** | ***Kappa*** |
| **Agreement between two reviewers on goal alignment** | 191 | 97.8 | <0.0001 | $\chi(2) = 0.9645$ |
| **Agreement between two reviewers on achievement of clinician referral aims** | 191 | 98.2 | <0.0001 | $\chi(2) = 0.9632$ |
| **Alignment between patient goal and surgeons' referral aim, n=167** | | | | |
| Did not align | 31 | 19 | <0.001 | $\chi(2) = 39.5$ |
| Did align | 55 | 33 | | |
| Partially aligned | 81 | 49 | | |
| **Whether patients achieved surgeons' referral aim, n=167** | | | | |
| Did not achieve | 70 | 42 | | |
| Achieved | 97 | 58 | | |
| **Patients achieved surgeons' referral aim when goals were misaligned, n=31** | | | | |
| Did not achieve | 26 | 84 | <0.001 | $\chi(2) = 39.5$ |
| Did achieve | 5 | 16 | | |
| **Patients achieved surgeons' referral aim when goals were aligned, n=55** | | | | |
| Did not achieve | 8 | 15 | <0.001 | $\chi(2) = 39.5$ |
| Did achieve | 47 | 85 | | |
| **Patients achieved surgeons' referral aim when goals were partially aligned, n=81** | | | | |

| | | | | |
|---|---|---|---|---|
| Did not achieve | 36 | 44 | <0.001 | $\chi(2) = 39.5$ |
| Did achieve | 45 | 55 | | |
| **Level of patient activation and achievement of surgeons' referral aim, n=161** | | | | |
| Level 1, did not achieve | 19 | 12 | P=0.855 | $\chi(2) = 0.777$ |
| Level 1, achieved | 20 | 12 | | |
| Level 2, did not achieve | 9 | 6 | | |
| Level 2, achieved | 13 | 8 | | |
| Level 3, did not achieve | 12 | 7 | | |
| Level 3, achieved | 16 | 10 | | |
| Level 4, did not achieve | 29 | 18 | | |
| Level 4, achieved | 43 | 27 | | |
| **Health literacy score and achievement of surgeons' referral aim, n=158** | | | | |
| BRIEF <13, did not achieve | 19 | 12 | P=0.570 | $\chi(2) = 1.12$ |
| BRIEF <13, achieved | 19 | 12 | | |
| BRIEF = >13<17, did not achieve | 12 | 7 | | |
| BRIEF =13<17 x achieved | 20 | 13 | | |
| BRIEF = >17, did not achieve | 38 | 24 | | |
| BRIEF = >17, achieved | 50 | 32 | | |

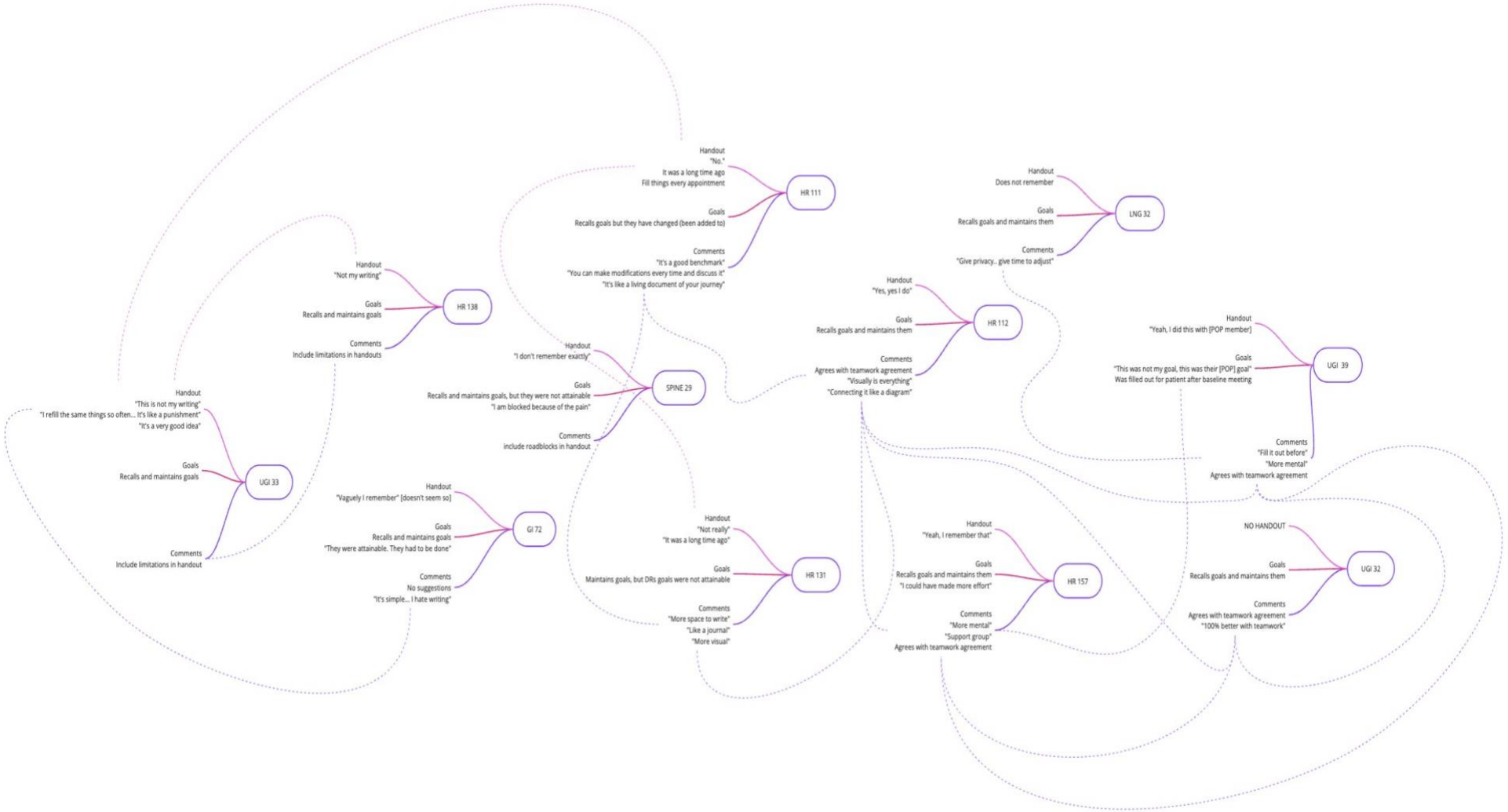
PAM is patient activation measure; higher levels represent higher activation. BREIF is the health literacy screening tool; higher score represents greater health literacy

**Supplementary Table 4.** Univariate and multivariate logistic regression models for attainment of surgeons' referral aim in 158 patients who received prehabilitation.

| **Attainment of surgeons' referral aim** | **Unadjusted** | | **Adjusted** | |
|---|---|---|---|---|
| | **Odds ratio (95% CI)** | **P-Value** | **Odds ratio (95% CI)** | **P-Value** |
| Goal alignment | 1.59 (1.06, 2.40) | 0.026 | 1.64 (1.07, 2.51) | 0.024 |
| Health literacy | 1.00 (0.93, 1.08) | 0.945 | 1.00 (0.92, 1.09) | 0.934 |
| Patient activation | 1.00 (0.99, 1.01) | 0.986 | 1.00 (0.99, 1.01) | 0.974 |
| Charleson co-morbidity index | 0.91 (0.80, 1.05) | 0.204 | 0.88 (0.71, 1.10) | 0.275 |
| Age | 0.99 (0.97, 1.02) | 0.587 | 1.00 (0.97, 1.05) | 0.682 |
| Male sex | 1.00 (0.54, 1.89) | 0.979 | 1.03 (0.53, 2.01) | 0.924 |

CI is confidence interval. Goal alignment (no alignment=reference value) and sex are categorical; Age, health literacy, patient activation, and Charlson co-morbidity index are continuous variables.

**Supplementary Figure 2.** Concept mapping of 11 semi-structured patient interviews. The participant responses are organized into three categories (handout recall, goals, and general comments') with the Teamwork Agreement included where relevant. Patient IDs are connected to the respective responses and lines have been drawn connecting themes touched on by multiple participants.



**Supplementary Table 5.** Semi-structured interview questions.

| **Interview questions** |
| --- |
| Do you remember filling this out? |
| Do you remember what your goal was? |
| Did you meet the goal you set for yourself? |
| How did the POP clinic contribute to your goal? Could this have been improved? |
| What do you think about your answers now compared to the beginning of the program? (e.g., Thinking about the goal throughout, was it an attainable goal, would you change anything about your goal?) |
| What was the goal that the clinic set for you? (e.g., What did you think about it? Did it align with your goal for yourself?) |
| Is there anything you like or dislike about the goal handout itself? (e.g., Is it worthwhile? How is the wording? How do you feel about the way it's used?) |
| What do you think about the training materials provided by POP? (e.g., How did you use them? How did you find them visually?) |
| What would you think about a "teamwork agreement" that clearly explains the expectations for the clinic and for the patient before you start the program? (e.g., Would this be helpful?) |

**Supplementary Table 6.** Coding scheme used in Nvivo software to organize interview responses.

| Category | Subcategory | Codes |
|---|---|---|
| Engagement Handout Recall | I recall this Engagement Handout | Recall vaguely |
| | | Recall completely |
| | I do not recall this Engagement Handout | Too much time has past |
| | | Dislike paperwork in general (all blurs together) |
| Goal Recall and Progress | I met my goal | Feel accomplished with at least one goal |
| | I did not meet my goal | Do no feel accomplished with any goals |
| | I would change my goal | Add new goal |
| | | Modify existing goal |
| | I would not change my goal | Accomplished already |
| | | Still hopes to accomplish |
| Personal Thoughts on Engagement Handout | Pros on Engagement Handout | Simple |
| | | It ties themes of POP together |
| | | Engages patients |
| | Cons on Engagement Handout | Designate area to write their personal barriers to adherence |

| | | |
|---|---|---|
| | | Be more visual |
| | | Record progress throughout the program |
| | | Allow privacy while the form is filled |
| | | Leave space for patients to write as much or as little as they would like |
| Perception of Teamwork Agreement | Idea resonates | Useful strategy to promote adherence |
| | Idea does not resonate | Not a useful strategy |