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Pre-Rehabilitation before Major Abdominal Surgery: The Emerging Role of Physiotherapists in Reducing Postoperative Complications - A Narrative Review

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Abstract:
Background: Major abdominal surgery causes a rapid reduction in physiological reserve and exposes patients to pulmonary complications, delayed mobility and loss of functional independence. Prehabilitation seeks to improve capacity during the interval between surgical decision and operation. Objective: To synthesize literature published from 2012 through 2020 concerning physiotherapy-led and multimodal prehabilitation before major abdominal surgery, with emphasis on postoperative complications and functional recovery. Methods: A structured narrative review approach was used. Peer-reviewed English-language studies and guidance published between January 2012 and December 2020 were considered when they examined preoperative exercise, inspiratory muscle training, physiotherapy education, functional assessment or multimodal prehabilitation in adults undergoing major abdominal surgery. Results: Evidence supports preoperative risk identification and indicates that aerobic and resistance exercise, inspiratory muscle training, education and immediate postoperative breathing strategies are feasible for selected patients. A multicentre trial showed that a single preoperative physiotherapy session reduced pulmonary complications after upper abdominal surgery. Multimodal programmes frequently improve preoperative functional capacity, although effects on complications and length of stay are inconsistent across heterogeneous studies. Conclusion: Physiotherapists can make a distinct contribution by assessing functional reserve, prescribing individualized exercise, teaching respiratory and mobility strategies, monitoring response and coordinating postoperative continuity. Prehabilitation should complement enhanced recovery pathways and be adapted to surgical timing, comorbidity and patient access. Standardized, adequately powered trials are required.

Keywords: prehabilitation; physiotherapy; abdominal surgery; postoperative pulmonary complications; exercise; inspiratory muscle training; enhanced recovery

Introduction

Major abdominal surgery is undertaken for malignant and non-malignant conditions involving the gastrointestinal, hepatobiliary, pancreatic, vascular and urological systems. Even when surgery is planned and technically successful, the perioperative period imposes a substantial physiological challenge. Anaesthesia, tissue injury, pain, inflammatory responses, fasting and bed rest interact to reduce pulmonary function, skeletal-muscle performance and mobility. Postoperative pulmonary complications (PPCs), infection, prolonged hospitalization and loss of independence are clinically important consequences. Patients with low functional reserve may struggle to withstand this stress and may not regain their preoperative level quickly.

Traditional perioperative rehabilitation has concentrated on recovery after surgery. Prehabilitation changes the timing of intervention. It uses the interval between the decision to operate and the surgical procedure to assess risk, improve reserve, teach self-management and plan postoperative recovery. The concept is analogous to training before a predictable physiological stressor. It does not imply that every complication can be prevented or that surgery should be delayed indiscriminately. Rather, it aims to make the available preoperative period therapeutically useful (Carli & Scheede-Bergdahl, 2015).

Physiotherapists are central because impaired exercise capacity, respiratory risk, weakness and movement behaviour fall directly within physiotherapy scope. A physiotherapist can evaluate function, prescribe aerobic and resistance training, deliver inspiratory muscle training, teach breathing and coughing strategies, rehearse early mobilization and identify equipment or discharge needs. Prehabilitation is often multimodal, adding nutritional optimization, smoking cessation and psychological support. The physiotherapy component nevertheless requires specific clinical reasoning and cannot be reduced to generic advice to “be active.”

Research between 2012 and 2020 expanded rapidly. Randomized and observational studies evaluated preoperative exercise in colorectal, upper abdominal and other major procedures; systematic reviews examined postoperative outcomes; and pragmatic trials tested scalable physiotherapy education. Findings are encouraging but not uniform. Patient selection, programme duration, supervision, surgical pathways and outcomes differ markedly (Barberan-Garcia et al., 2018; Boden et al., 2018; Gillis et al., 2014; Moran et al., 2016). This review synthesizes that evidence and translates it into a practical role for physiotherapists while maintaining appropriate caution.

Review Aim and Method

This narrative review examines how physiotherapy-led and multimodal prehabilitation may influence postoperative complications and functional recovery in adults undergoing major abdominal surgery. The review addresses five clinical questions: which patients are likely to benefit; what should be assessed; which exercise and respiratory interventions are supported; how prehabilitation should be integrated with enhanced recovery; and what limitations prevent firm conclusions.

The evidence window was prospectively restricted to January 2012 through December 2020. Priority was given to PubMed-indexed randomized trials, cohort studies, systematic reviews and perioperative guidance involving preoperative exercise, inspiratory muscle training, physiotherapy education, functional capacity, PPCs or postoperative recovery. The emphasis was major abdominal surgery, while

broader surgical evidence was used only when directly relevant to intervention principles. Publications outside the date window were excluded.

A narrative approach was chosen because interventions and outcomes were too heterogeneous for a new quantitative synthesis. No participant data were collected, no meta-analysis was performed and the review does not claim exhaustive systematic retrieval. Evidence was interpreted according to design, clinical relevance, intervention dose and outcome specificity. Improved six-minute walk distance, for example, was not assumed to prove fewer pulmonary complications. Recommendations distinguish direct evidence from reasonable physiotherapy extrapolation.

What Is Prehabilitation?

Prehabilitation is a process that begins before surgery and aims to enhance functional capacity so a patient can better tolerate the operation and recover afterward. It may be unimodal, such as inspiratory muscle training, or multimodal, combining exercise, nutrition and psychological support. The programme may last several weeks or consist of a brief preadmission intervention when surgical timing is short. Its defining feature is purposeful preparation before the stressor rather than rehabilitation after impairment has occurred.

The physiological model can be visualized as a trajectory. A patient enters surgery with a baseline level of reserve, experiences an acute postoperative decline and then recovers at a rate influenced by complications, activity and underlying health. Increasing preoperative capacity may raise the starting point, while education and rehearsal may accelerate postoperative activation. For frail patients, preserving independence may be a meaningful outcome even when hospital length of stay does not change.

Prehabilitation should be integrated with enhanced recovery after surgery (ERAS). ERAS pathways address evidence-based elements across anaesthesia, analgesia, nutrition, tubes, mobilization and discharge. Prehabilitation strengthens the preoperative phase and prepares the patient to participate in postoperative elements. It is not an alternative to minimally invasive techniques, infection prevention, thromboprophylaxis, optimal pain control or early feeding.

The available time matters. Cancer pathways may allow only two to four weeks, and urgent surgery may allow days. A short interval favours high-value education, respiratory training and a safe home programme. A longer interval permits progressive conditioning. The programme should not create a barrier to timely surgery, and any proposed delay requires surgical—not physiotherapy—decision-making.

Successful prehabilitation is patient-centred. Goals may include walking independently on the ward, climbing home stairs, reducing respiratory risk, maintaining work or avoiding institutional discharge. These goals shape the exercise prescription and improve adherence. A technically sophisticated programme that the patient cannot access or sustain is less useful than a simple, monitored programme delivered consistently.

Why Major Abdominal Surgery Reduces Reserve

Abdominal surgery alters respiratory mechanics through anaesthesia, pain, diaphragmatic dysfunction and recumbency. Functional residual capacity falls, breathing may become shallow and cough can be inhibited. Atelectasis and secretion retention may contribute to pneumonia and other PPCs. Upper abdominal incisions and longer open procedures are particularly relevant. PPCs are associated with

adverse recovery and resource use, making prevention an important physiotherapy objective (Fernandez-Bustamante et al., 2017; Neto et al., 2014).

Skeletal-muscle loss begins quickly when intake and activity fall. The surgical stress response increases catabolism, while pre-existing cancer, treatment, pain or obstruction may already have reduced weight and strength. Even short bed rest can affect older or frail adults disproportionately. Reduced lower-limb strength compromises transfers and walking; low aerobic reserve makes routine activity physiologically demanding.

Functional capacity reflects the interaction of cardiac, pulmonary, muscular and behavioural systems. Cardiopulmonary exercise testing can quantify integrated reserve where available, while field tests provide practical measures. Low capacity is not merely a predictor; some components can be modified. Training may increase efficiency, strength and confidence even when comorbidity remains.

Psychological stress also matters. Anxiety may reduce concentration and willingness to exercise, and a cancer diagnosis can overwhelm patients with appointments and decisions. Education, realistic goal setting and supportive contact can improve engagement. Physiotherapists should recognize distress and refer appropriately rather than attempting to deliver specialist psychological treatment.

The rationale for prehabilitation is therefore multifactorial. Aerobic work supports endurance; resistance training addresses weakness; inspiratory muscle training targets respiratory muscle performance; education improves immediate postoperative behaviours; and coordination with nutrition supports adaptation. The effect of the package depends on adherence, baseline risk and surgical context.

Preoperative Assessment and Risk Stratification

Assessment begins with the operation and medical pathway. The physiotherapist should know the expected procedure, open or minimally invasive approach, timing, cancer treatment, comorbid disease and postoperative restrictions. Symptoms requiring medical review include unstable chest pain, acute breathlessness, fever, uncontrolled hypertension, syncope, new neurological deficit or severe unexplained pain. Exercise clearance should match the patient's risk and local pathway.

History should cover activity, exercise tolerance, falls, smoking, respiratory symptoms, previous anaesthesia, sleep, fatigue, pain and social support. Home layout and stairs affect postoperative planning. Frailty, recent weight loss and nutritional risk should trigger multidisciplinary attention. Medication, anaemia and ongoing chemotherapy can alter tolerance.

Functional tests should be selected for safety and repeatability. The six-minute walk test is widely used in prehabilitation research; gait speed, sit-to-stand tests, Timed Up and Go and stair assessment may add practical information. Handgrip strength can support global assessment but does not replace lower-limb testing. Cardiopulmonary exercise testing provides peak oxygen uptake and anaerobic threshold when resources and expertise permit. Baseline measures enable personalized prescription and demonstrate change.

Respiratory assessment includes breathing pattern, cough effectiveness, chest symptoms and inspiratory muscle strength where measurable. The presence of chronic lung disease, smoking, low mobility or a high-risk incision may increase the value of targeted education. The physiotherapist should also assess the patient's capacity to understand and perform exercises immediately after surgery.

Risk stratification guides intensity and supervision; it should not become a reason to exclude the highest-risk patients automatically. A fit patient may use a partly unsupervised programme with remote

monitoring. A frail patient may need lower initial doses, close supervision and rapid multidisciplinary review. The balance is to create enough overload for adaptation without destabilizing medical status.
Goals and feasibility are documented before prescription. Travel distance, employment, caregiving, finances and digital access influence attendance. Home exercise can reduce burden, but technique and response require monitoring. A hybrid model with an initial in-person assessment, supervised progression and planned home sessions may be practical.

Exercise Prescription and Physiotherapy Interventions

Aerobic exercise is commonly delivered through walking or cycling. Intensity may be prescribed using heart-rate response, workload, talk test or rating of perceived exertion. Interval training can help patients who cannot sustain continuous activity. A programme may begin with short bouts at moderate effort and progress through duration, frequency and intensity. The exact dose should reflect surgical timing and recovery from concurrent cancer treatment.
High-intensity interval training has attracted interest because it can produce adaptation within a short preoperative window, but it requires appropriate screening and supervision. It should not be assumed superior for every patient. Moderate continuous or interval walking may offer better adherence for older, frail or treatment-fatigued individuals. The physiotherapist should record the prescribed and completed dose rather than merely stating that exercise was advised.
Resistance training targets major muscle groups needed for postoperative function: knee extensors, hip extensors and abductors, calf muscles, trunk and upper limbs. Exercises may include sit-to-stand, step-ups, squats to a chair, heel raises, rowing and pressing with bands or weights. Loads should allow controlled repetitions with progressive overload. Abdominal discomfort, hernia, bone metastases and vascular or surgical precautions influence selection.
Functional training rehearses expected postoperative tasks. Practising bed mobility, log rolling where appropriate, supported coughing, transfers, corridor walking and stairs can reduce uncertainty. The patient should understand that early postoperative movement will occur under clinical guidance and is not a test of toughness. An assistive device may be trialled preoperatively when weakness or balance deficits are present.
Inspiratory muscle training uses threshold loading to strengthen inspiratory muscles. Programmes often prescribe repeated breaths against a percentage of maximal inspiratory pressure with progressive adjustment. Reviews have suggested that preoperative inspiratory muscle training can reduce PPCs in selected surgical populations, though trials vary in quality and procedure type (Katsura et al., 2015). Technique, adherence and symptoms must be monitored.
Breathing education differs from muscle training. Boden et al. (2018) demonstrated that a single preoperative physiotherapy session teaching breathing exercises and early ambulation halved PPC incidence after upper abdominal surgery. The intervention was valuable partly because it enabled patients to begin breathing exercises immediately after regaining consciousness. This supports a scalable role for preoperative education even when weeks of training are unavailable.
Incentive spirometry should not be prescribed as an isolated ritual without evidence-based context. A Cochrane review found low-quality evidence and no clear benefit for incentive spirometry alone after upper abdominal surgery (do Nascimento Junior et al., 2014). Physiotherapists should prioritize effective education, deep breathing, coughing, early mobilization and individualized respiratory care rather than device use without purpose.

Monitoring includes exertion, pain, dizziness, unusual breathlessness, heart-rate response when relevant and delayed fatigue. Progression should be planned but flexible. A sudden decline may reflect infection, anaemia, treatment toxicity or disease progression and warrants communication. The safest programme is not one with no challenge; it is one in which challenge is dosed, observed and adjusted.

Multimodal Prehabilitation

Exercise adaptation depends on adequate substrate. Malnutrition and weight loss are common before gastrointestinal cancer surgery and can limit response. Dietitians assess intake, protein requirements and nutrition-impact symptoms. Physiotherapists should screen for obvious risk and refer rather than independently prescribing medical nutrition. Coordinated timing of protein intake and resistance exercise may be practical, but individualized nutrition remains essential.

Multimodal programmes typically combine aerobic and resistance exercise with nutritional counselling and anxiety-management support. Gillis et al. (2014) reported that prehabilitation around colorectal cancer surgery improved the trajectory of functional exercise capacity compared with rehabilitation initiated after surgery. Minnella et al. (2017) similarly described favourable functional-capacity outcomes from a multimodal programme. These findings reinforce the importance of treating reserve before the operation.

Evidence on complications is more variable. In frail patients undergoing colorectal cancer resection, the 2020 randomized trial by Carli et al. did not demonstrate a clear reduction in 30-day postoperative complications from multimodal prehabilitation compared with postoperative rehabilitation. This important finding prevents overstatement. Functional improvement and complication prevention are related but distinct outcomes, and a programme can be feasible without changing every surgical endpoint.

Smoking cessation, alcohol reduction, anaemia management, diabetes control and medication optimization may influence risk but require wider perioperative services. Physiotherapists reinforce and coordinate these priorities without replacing responsible clinicians. A multidisciplinary clinic can reduce fragmented advice and align messages about activity, nutrition and postoperative expectations.

Psychological support ranges from clear education and motivational interviewing to specialist care. Physiotherapists can use shared goals, self-monitoring and problem solving to support adherence. Persistent severe anxiety, depression or inability to cope requires referral. Multimodal care is most effective when disciplines collaborate around one plan rather than adding disconnected appointments.

Evidence for Postoperative Outcomes

Systematic reviews available by 2020 generally suggested that preoperative exercise can improve preoperative fitness and may reduce selected postoperative morbidity, but certainty was limited by small trials and heterogeneity. Moran et al. (2016) reported that preoperative exercise training may reduce postoperative complications after major abdominal surgery, while emphasizing the need for stronger evidence. Later reviews continued to find variability in programme content and outcome reporting.

Barberan-Garcia et al. (2018) evaluated personalized prehabilitation in high-risk patients undergoing major abdominal surgery and reported fewer postoperative complications. The programme used supervised endurance training and promotion of physical activity, illustrating targeted use in patients most likely to benefit. Its individualized approach is clinically attractive but resource intensive.

The LIPPSMAck-POP trial provides direct physiotherapy evidence. A single 30-minute session, delivered before surgery, combined education with training in self-directed breathing exercises and early ambulation. PPCs were reduced, with an absolute risk reduction reported by the investigators. The intervention is notable because it is brief and deployable in preadmission clinics (Boden et al., 2018).

Colorectal prehabilitation trials have frequently used the six-minute walk test. Gillis et al. (2014) found better functional recovery when the multimodal programme began before surgery rather than after it. Minnella et al. (2017) reported improvements in functional capacity in colorectal cancer pathways. However, Carli et al. (2020) found no significant difference in 30-day postoperative complications in frail patients. Together, these results suggest that functional capacity may be more responsive than broad complication composites.

Length of stay is influenced by surgical technique, discharge policy, complications and social context. It should not be treated as a pure measure of physiotherapy effect. Similarly, readmission and mortality require large samples. Patient-centred outcomes—independence, ability to return home, recovery of walking and quality of life—deserve equal attention.

The overall evidence supports offering prehabilitation within a monitored pathway, particularly for higher-risk elective patients, while avoiding guarantees. The strongest claim is that selected interventions improve preparedness and functional capacity and that preoperative physiotherapy education can reduce PPCs in upper abdominal surgery. Evidence for universal reductions in all complications remains insufficient.

Implementation, Safety and Equity

Implementation begins with referral early enough to act. Surgical clinics can use simple triggers such as low activity, slow gait, frailty, respiratory disease, planned open upper abdominal surgery or anticipated delay before operation. Physiotherapy assessment should occur promptly; a programme that starts days before surgery may still provide education, while a longer window permits progressive training.

Safety requires clear escalation rules. Exercise should be modified or paused for acute infection, unstable cardiopulmonary symptoms, syncope, uncontrolled pain or significant treatment toxicity. Cancer-related bone disease, thrombocytopenia, anaemia and recent procedures require individual decisions with the medical team. Patients should receive contact instructions rather than being expected to judge complex symptoms alone.

Adherence is often the limiting dose. Programmes should fit daily life, use accessible equipment and include progress feedback. Logs, scheduled calls and wearable devices can support monitoring, but technology is optional. Supervised sessions may improve fidelity and confidence; home sessions extend volume. A hybrid model balances both.

Equity deserves explicit attention. Rural patients, people with low income and those with caregiving or employment responsibilities may be unable to attend frequent hospital sessions. Requiring intensive attendance could widen disparities. Core programmes can use walking, chair-based resistance and low-cost bands, supported by telephone follow-up and local physiotherapy where available. Written materials should be understandable and available in appropriate languages.

Service evaluation should measure referral uptake, time to assessment, adherence, adverse events, functional change, PPCs and patient experience. Programmes should report who is not reached. A clinically effective intervention has limited public-health value if access is restricted to highly motivated, fitter patients living near tertiary centres.

Clinical Framework for Physiotherapists

A practical pathway can be organized into five steps. First, screen for functional and pulmonary risk at surgical decision. Second, perform a focused assessment and identify red flags, barriers and goals. Third, prescribe an individualized package using aerobic, resistance, respiratory and functional components. Fourth, reassess response and communicate relevant changes to the surgical team. Fifth, ensure continuity into early postoperative mobility and discharge planning.

The prescription should specify frequency, intensity, time and type. For each component, progression criteria and alternatives for difficult days should be recorded. The patient should know which exercises are safe unsupervised and which require supervision. Education should include postoperative breathing, supported cough, early mobilization expectations and the importance of reporting symptoms.

Reassessment may repeat the six-minute walk test, sit-to-stand performance, inspiratory pressure or a patient-specific functional measure. A lack of improvement does not automatically mean failure; maintaining capacity during neoadjuvant treatment may be meaningful. Deterioration should prompt review of adherence, nutrition, medical status and programme dose.

Postoperative handover closes the loop. The ward team should know baseline mobility, device needs and high-risk features. Prehabilitation gains can be lost if postoperative movement is delayed without reason. Conversely, mobilization must respect surgical and physiological stability. The physiotherapist helps translate preparation into safe action.

Quality requires documentation and fidelity. Services should avoid labelling a leaflet alone as comprehensive prehabilitation, while recognizing that targeted education can itself be evidence-based. The content, supervision and completed dose should be transparent so outcomes can be interpreted.

From Prehabilitation to Postoperative Recovery

Prehabilitation is most meaningful when it connects directly to the postoperative plan. The patient should enter hospital knowing why breathing exercises, supported coughing and early mobilization matter, but expectations must remain realistic. Immediately after surgery, physiological stability, analgesia, nausea, lines and drains affect participation. The preoperative programme prepares behaviour and capacity; the postoperative clinician still reassesses before mobilization.

Respiratory care should be risk based. Patients taught deep breathing before surgery can begin promptly when awake and stable, as demonstrated in the intervention tested by Boden et al. (2018). Instruction should cover an effective inspiratory effort, supported cough and the relationship between upright positioning, movement and ventilation. Repetition before surgery reduces the cognitive burden of learning while drowsy or in pain. Patients must also understand that breathing exercises do not replace walking or appropriate medical care.

Early mobilization commonly progresses from bed exercises and sitting to standing, transfers and corridor ambulation. Progress depends on symptoms, haemodynamics and surgical restrictions. A patient who trained sit-to-stand and walking before surgery may perform these tasks more confidently, but staff should not assume independence without assessment. Orthostatic intolerance, epidural effects, anaemia and pain can make performance different from the preoperative clinic.

Continuity of measures improves clinical interpretation. If gait speed, chair rise or six-minute walk distance was recorded before surgery, the same measure can document recovery at discharge and follow-up when safe. The goal is not to test patients excessively but to identify incomplete recovery and guide

further rehabilitation. A patient discharged quickly may still have substantial functional loss; hospital length of stay alone can conceal this burden.

Discharge planning should begin during prehabilitation when home barriers are predictable. Stairs, limited caregiver support, rural travel and bathroom access may require early action. Temporary equipment can be arranged, and patients can practise with an assistive device. This anticipatory work may reduce delayed discharge and unsafe improvisation, although equipment should be confirmed after surgery because needs can change.

After discharge, walking and exercise should progress gradually within surgical guidance. Patients need clear advice about wound symptoms, fever, breathlessness, calf pain, dizziness and other warning signs that require medical contact. Physiotherapists should avoid giving conflicting lifting restrictions and instead align recommendations with the surgical team. Functional progression can emphasize frequent walking, restoration of daily tasks and staged return to resistance training.

Some patients recover smoothly and need only self-management; others develop PPCs, infection, prolonged fatigue or loss of confidence. A stepped-care model can provide routine advice to all, scheduled review for high-risk patients and intensive rehabilitation for those with complications or persistent deficits. This model uses resources more efficiently than giving identical treatment to every patient.

Prehabilitation may also improve the therapeutic relationship. Contact before surgery allows the physiotherapist to understand baseline function and patient priorities. Postoperatively, advice can be anchored to familiar goals rather than delivered as generic ward instructions. This continuity is particularly valuable for frail patients and those anxious about movement.

Outcome evaluation should extend beyond discharge. Recovery of independence, return to usual activity and health-related quality of life may occur over weeks or months. Follow-up can identify patients whose recovery has plateaued and connect them with community rehabilitation. A prehabilitation service should therefore be designed as the first phase of a perioperative rehabilitation pathway, not an isolated preoperative class.

Behaviour Change and Adherence

The biological effectiveness of exercise depends on whether the patient completes it. Preoperative periods are crowded with investigations, consultations, travel and emotional stress. Non-adherence should not be interpreted as lack of motivation without exploring pain, fatigue, transport, work, caregiving and fear. A collaborative prescription begins with the patient's priorities and available time.

Specific action plans are more useful than vague advice. "Walk at a moderate effort for ten minutes after breakfast and dinner on five days this week" is observable and adjustable. Resistance exercises can be linked to routine activities and recorded in a simple log. The physiotherapist should check comprehension through demonstration and teach-back rather than relying on written instructions alone.

Feedback supports confidence. Showing change in walking duration, repetitions or recovery can make progress visible. When function does not improve, the clinician can distinguish inadequate dose from medical limitation. Maintenance may itself be success during neoadjuvant chemotherapy or progressive disease, and acknowledging this prevents discouragement.

Family involvement can improve adherence and safety if roles are clear. A family member may accompany walks, help organize equipment or remind the patient about sessions. They should not

provide unsafe lifting or pressure the patient to train through concerning symptoms. Education should include both encouragement and boundaries.

Supervision should be allocated according to risk and need. Higher-risk patients may benefit from frequent observation; lower-risk patients can use home sessions with scheduled contact. Remote delivery can reduce travel but requires suitable technology, privacy and a safe exercise environment. Video cannot fully replace physical assessment when balance, cardiorespiratory response or technique is uncertain.

Motivational communication avoids fear-based messages about complications. Patients should understand that prehabilitation improves preparedness but cannot guarantee an uncomplicated operation. Honest framing protects trust and supports informed participation. The aim is shared preparation, not assigning responsibility for surgical outcomes to the patient. Regular review also allows the programme to remain responsive when operative dates, cancer treatment schedules, symptoms or family circumstances change unexpectedly. This flexibility is essential for safe, realistic and patient-centred perioperative care.

Limitations and Research Priorities

The literature from 2012–2020 has important limitations. Studies differ in operation, cancer status, baseline risk, duration, exercise dose and co-interventions. Samples are often small, and multimodal designs make it difficult to isolate physiotherapy effects. Usual care varies across hospitals, especially within ERAS pathways.

Outcome definitions are inconsistent. PPCs may be diagnosed by different criteria, while complication composites combine events of unequal clinical importance. Functional capacity is commonly measured, but long-term participation and independence are less frequently reported. Blinding exercise participants is not possible, and adherence can bias results toward healthier patients.

Future trials should stratify by risk, use standardized complication definitions and report intervention fidelity. Comparative work is needed to determine which patients require intensive supervised programmes and which benefit from scalable education plus home exercise. Economic evaluation should include programme cost, complications, length of stay and patient travel burden.

Research should also address rural and resource-limited settings, where prehabilitation may need decentralized delivery. Trials should report recruitment and non-participation to identify inequity. Long-term outcomes should include return to usual activity, quality of life and persistent disability.

Mechanistic studies can clarify whether improved aerobic capacity, inspiratory strength, muscle function or behaviour mediates benefit. Until stronger evidence is available, claims should remain proportionate: prehabilitation improves preparedness and frequently improves functional capacity, but not every programme reduces every postoperative complication.

Conclusion

Prehabilitation uses the waiting period before major abdominal surgery to assess risk, improve reserve and prepare patients for recovery. Physiotherapists contribute through functional testing, individualized aerobic and resistance exercise, inspiratory muscle training, breathing education, mobility rehearsal and postoperative continuity. Evidence published between 2012 and 2020 supports feasibility and improvement in functional capacity, while a major multicentre trial demonstrates that brief preoperative physiotherapy education can reduce PPCs after upper abdominal surgery.

The evidence does not justify a universal protocol or guarantees about complications and length of stay. Programmes should be integrated with ERAS, nutrition and medical optimization, tailored to risk and surgical timing, and accessible to patients who cannot attend intensive hospital-based services. Clear monitoring and escalation protect safety.

For practice, the central message is timely referral and purposeful prescription. Even a short preoperative window can support education and respiratory preparation; longer windows permit progressive conditioning. Further standardized, adequately powered studies are required to identify optimal components, dose and cost-effective delivery models.

REFERENCES:

1. Barberan-Garcia, A., Ubré, M., Roca, J., Lacy, A. M., Burgos, F., Risco, R., Momblán, D., Balust, J., Blanco, I., Martínez-Pallí, G., & others. (2018). Personalised prehabilitation in high-risk patients undergoing elective major abdominal surgery: A randomized blinded controlled trial. Annals of Surgery, 267(1), 50–56.
2. Boden, I., Skinner, E. H., Browning, L., Reeve, J., Anderson, L., Hill, C., Robertson, I. K., Story, D., & Denehy, L. (2018). Preoperative physiotherapy for the prevention of respiratory complications after upper abdominal surgery: Pragmatic, double blinded, multicentre randomised controlled trial. BMJ, 360, j5916. https://doi.org/10.1136/bmj.j5916
3. Carli, F., & Scheede-Bergdahl, C. (2015). Prehabilitation to enhance perioperative care. Anesthesiology Clinics, 33(1), 17–33.
4. Carli, F., Bousquet-Dion, G., Awasthi, R., Elsherbini, N., Liberman, S., Boutros, M., Stein, B., Charlebois, P., Ghitulescu, G., Morin, N., Jagoe, R. T., & Scheede-Bergdahl, C. (2020). Effect of multimodal prehabilitation vs postoperative rehabilitation on 30-day postoperative complications for frail patients undergoing resection of colorectal cancer: A randomized clinical trial. JAMA Surgery, 155(3), 233–242.
5. do Nascimento Junior, P., Módolo, N. S. P., Andrade, S., Guimarães, M. M. F., Braz, L. G., & El Dib, R. (2014). Incentive spirometry for prevention of postoperative pulmonary complications in upper abdominal surgery. Cochrane Database of Systematic Reviews, 2014(2), CD006058.
6. Fernandez-Bustamante, A., Frendl, G., Sprung, J., Kor, D. J., Subramaniam, B., Martinez Ruiz, R., Lee, J. W., Henderson, W. G., Moss, A., Mehdiratta, N., Colwell, M. M., Bartels, K., Kolodzie, K., Giquel, J., Vidal Melo, M. F., & others. (2017). Postoperative pulmonary complications, early mortality, and hospital stay following noncardiothoracic surgery. JAMA Surgery, 152(2), 157–166.
7. Gillis, C., Li, C., Lee, L., Awasthi, R., Augustin, B., Gamsa, A., Liberman, A. S., Stein, B., Charlebois, P., Feldman, L. S., & Carli, F. (2014). Prehabilitation versus rehabilitation: A randomized control trial in patients undergoing colorectal resection for cancer. Anesthesiology, 121(5), 937–947.
8. Guo, P. (2015). Preoperative education interventions to reduce anxiety and improve recovery among cardiac surgery patients: A review of randomised controlled trials. Journal of Clinical Nursing, 24(1–2), 34–46.
9. Katsura, M., Kuriyama, A., Takeshima, T., Fukuhara, S., & Furukawa, T. A. (2015). Preoperative inspiratory muscle training for postoperative pulmonary complications in adults

undergoing cardiac and major abdominal surgery. Cochrane Database of Systematic Reviews, 2015(10), CD010356.

10. Minnella, E. M., Awasthi, R., Loiselle, S.-E., Agnihotram, R. V., Ferri, L. E., & Carli, F. (2017). Effect of exercise and nutrition prehabilitation on functional capacity in esophagogastric cancer surgery: A randomized clinical trial. JAMA Surgery, 153(12), 1081–1089.
11. Minnella, E. M., Bousquet-Dion, G., Awasthi, R., Scheede-Bergdahl, C., & Carli, F. (2017). Multimodal prehabilitation improves functional capacity before and after colorectal surgery for cancer: A five-year research experience. Acta Oncologica, 56(2), 295–300.
12. Moran, J., Guinan, E., McCormick, P., Larkin, J., Mockler, D., Hussey, J., Moriarty, J., & Wilson, F. (2016). The ability of prehabilitation to influence postoperative outcome after intra-abdominal operation: A systematic review and meta-analysis. Surgery, 160(5), 1189–1201.
13. Neto, A. S., Hemmes, S. N. T., Barbas, C. S. V., Beiderlinden, M., Fernandez-Bustamante, A., Futier, E., Gajic, O., El-Tahan, M. R., Ghamdi, A. A., Günay, E., Jaber, S., Kokulu, S., Kozian, A., Licker, M., Lin, W.-Q., Maslow, A. D., Memtsoudis, S. G., Reis Miranda, D., Moine, P., & others. (2014). Incidence of mortality and morbidity related to postoperative lung injury in patients who have undergone abdominal or thoracic surgery: A systematic review and meta-analysis. The Lancet Respiratory Medicine, 2(12), 1007–1015.
14. Steffens, D., Beckenkamp, P. R., Hancock, M., Solomon, M., & Young, J. (2018). Preoperative exercise halves the postoperative complication rate in patients with lung cancer: A systematic review of the effect of exercise on complications, length of stay and quality of life in patients with cancer. British Journal of Sports Medicine, 52(5), 344.