

Effectiveness of Early Physiotherapy Rehabilitation Following Major Abdominal Surgery: Impact on Functional Recovery and Hospital Stay

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ABSTRACT

Major abdominal surgery is associated with postoperative complications, prolonged immobility and delayed functional recovery, and early physiotherapy is increasingly advocated within enhanced-recovery pathways. This paper reports a randomised controlled study evaluating the effectiveness of early physiotherapy rehabilitation following major abdominal surgery, focusing on functional recovery and hospital length of stay. One hundred and eighteen patients were randomised to early physiotherapy, comprising early ambulation and breathing exercises commenced on the first postoperative day, or to standard care, and were assessed for length of stay, postoperative pulmonary complications, time to mobilisation and functional recovery. The early physiotherapy group had a shorter hospital stay, fewer postoperative pulmonary complications, earlier mobilisation and faster recovery of walking capacity than the standard-care group. These findings indicate that early physiotherapy rehabilitation accelerates functional recovery and reduces hospital stay and pulmonary complications after major abdominal surgery, supporting its routine incorporation into postoperative care. The single-centre design and inherent difficulty of blinding indicate areas for methodological strengthening in future trials.

KEYWORDS: *Early Physiotherapy, Abdominal Surgery, Functional Recovery, Hospital Stay, Pulmonary Complications, Early Mobilisation, Enhanced Recovery, Rehabilitation*

INTRODUCTION

Major abdominal surgery, including procedures on the gastrointestinal tract, liver and other abdominal organs, is commonly associated with significant postoperative challenges, including pain, immobility, postoperative pulmonary complications and delayed functional recovery [1]. These challenges can prolong hospital stay, increase healthcare costs and adversely affect patient outcomes. Reducing the burden of postoperative complications and accelerating recovery are therefore important goals of perioperative care [1], [2].

These complications are not merely transient inconveniences; they are associated with increased morbidity, longer hospital stay and higher costs, and in severe cases with mortality [2]. Their prevention is therefore a major objective of postoperative care, and interventions that reliably reduce them carry substantial clinical and economic value.

Postoperative pulmonary complications are among the most frequent and serious problems following major abdominal surgery, arising from impaired respiratory mechanics, reduced lung volumes, pain-related splinting and immobility [2], [3]. Prolonged immobility additionally contributes to deconditioning, venous thromboembolism risk and delayed return of function. Physiotherapy interventions, including early ambulation and breathing exercises, are designed to counter these effects by promoting lung expansion, clearing secretions and restoring mobility [3], [4].

Within these pathways, physiotherapists are key members of the perioperative team, responsible for implementing and progressing mobilisation and respiratory care, and their involvement is increasingly regarded as integral rather than optional [4], [5].

Enhanced-recovery-after-surgery pathways have increasingly emphasised early mobilisation as a core component of postoperative care, based on evidence that prolonged bed rest is harmful and that early activity accelerates recovery [4], [5]. Early physiotherapy, commenced on the first postoperative day, combines early ambulation with respiratory interventions to address both the pulmonary and functional consequences of surgery. However, the magnitude of benefit attributable to structured early physiotherapy, and its effect on functional recovery and hospital stay specifically, warrants continued evaluation in controlled studies.

The problem addressed in this study is the need for controlled evidence of the effectiveness of

early physiotherapy rehabilitation following major abdominal surgery, with respect to functional recovery, hospital length of stay and postoperative pulmonary complications. Accordingly, this randomised controlled study compares early physiotherapy with standard care, with the aim of quantifying its impact and informing postoperative rehabilitation practice.

LITERATURE REVIEW

Postoperative pulmonary complications after major abdominal surgery are well documented and are associated with increased morbidity, prolonged hospital stay and higher costs [2], [3]. The mechanisms involve reduced functional residual capacity, diaphragmatic dysfunction, impaired cough and pain-related restriction of breathing, all of which predispose to atelectasis and infection. Physiotherapy interventions targeting these mechanisms, including breathing exercises, lung-expansion techniques and early mobilisation, have therefore been widely studied as preventive strategies [3], [4].

Evidence supports the value of early mobilisation in particular. Prolonged bed rest after surgery is associated with deconditioning, pulmonary complications and venous thromboembolism, whereas early ambulation promotes lung expansion, improves circulation and accelerates the return of function [4], [5]. Within enhanced-recovery pathways, early mobilisation is a key element associated with reduced length of stay and improved recovery, and physiotherapists play a central role in its implementation [5]. The role of specific respiratory techniques, such as incentive spirometry, has been debated, with some evidence suggesting that early mobilisation and breathing exercises are the principal active components [3].

Studies evaluating physiotherapy after abdominal surgery have generally reported reductions in pulmonary complications and improvements in recovery, although heterogeneity in interventions, populations and outcome measures has been noted [3], [4]. Functional recovery, increasingly recognised as a patient-centred outcome, can be assessed using measures such as the six-minute walk test and time to mobilisation milestones [6]. Randomised controlled trials combining a clearly defined early-physiotherapy intervention with both functional-recovery and length-of-stay outcomes add value to this literature, which is the contribution of the present study.

The distinction between early ambulation and respiratory techniques is conceptually important, because although both are commonly delivered together, they may act through partly different

mechanisms and may not contribute equally to outcomes [3], [4]. Some evidence suggests that early mobilisation is the dominant active ingredient, with formal breathing devices adding little beyond what mobilisation and simple breathing exercises achieve. Clarifying these relative contributions has practical implications for how postoperative physiotherapy is prioritised and resourced.

RESEARCH GAP

Although early mobilisation and physiotherapy after abdominal surgery are supported by evidence and embedded in enhanced-recovery pathways, trials vary in the specific interventions delivered and the outcomes assessed, and the combined effect of structured early physiotherapy on functional recovery and hospital stay is not always clearly quantified. There is a need for controlled studies that evaluate a clearly defined early-physiotherapy programme against standard care, measuring functional recovery, length of stay and pulmonary complications together. This study addresses that gap through a randomised comparison.

OBJECTIVES

The objectives of the study were as follows:

- To compare hospital length of stay between early-physiotherapy and standard-care groups after major abdominal surgery.
- To evaluate the effect of early physiotherapy on postoperative pulmonary complications.
- To assess functional recovery, including time to mobilisation and walking capacity.
- To inform the routine incorporation of early physiotherapy into postoperative care.

METHODOLOGY

Study Design and Participants

A randomised controlled study was conducted in patients undergoing major abdominal surgery. Eligible patients were adults scheduled for major elective abdominal procedures who were able to participate in physiotherapy. Patients with conditions precluding mobilisation or with planned prolonged intensive-care admission were excluded. Of 136 patients assessed, 118 were randomised in equal numbers to the early-physiotherapy or standard-care group. Informed consent was obtained and standard ethical requirements were met. Baseline characteristics are summarised in Table 1, and the study flow is shown in Figure 1.

Intervention

The early-physiotherapy group received a structured programme commenced on the first

postoperative day, comprising early ambulation progressed according to tolerance, deep breathing and lung-expansion exercises, and supported coughing techniques, delivered by physiotherapists [3], [4]. The standard-care group received usual postoperative care without structured early physiotherapy, mobilising according to routine ward practice. Both groups received standard analgesia and medical care, and the intervention components are summarised in Table 2.

Outcome Measures

The primary outcomes were hospital length of stay and the incidence of postoperative pulmonary complications, the latter defined using established criteria based on respiratory signs, imaging and clinical findings [2], [3]. Secondary outcomes included time to first mobilisation and functional recovery assessed by the six-minute walk distance at successive postoperative time points [6]. Outcomes were recorded by assessors following standardized procedures.

Statistical Analysis

Length of stay and continuous outcomes were compared between groups using appropriate comparative methods, and the incidence of pulmonary complications was compared as proportions. Functional recovery over time was compared between groups. Results are presented in Table 3, with length-of-stay and complication outcomes shown in Figure 2 and functional recovery in Figure 3.

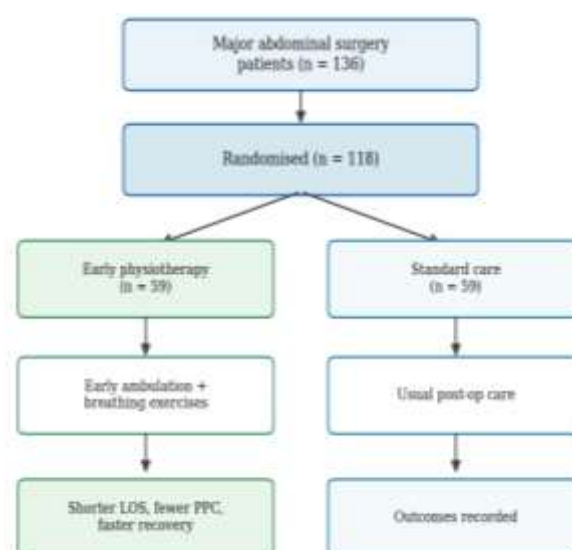


Figure 1: Flow of participants through randomisation, intervention and outcome assessment

Table 1: Baseline characteristics of participants (n = 118).

Characteristic	Value	Notes
Mean age (years)	58.3 ± 12.6	Range 28-79
Female / Male	54 / 64	46% female
Upper / lower abdominal surgery	66 / 52	
Mean operative time (hours)	3.1 ± 1.0	
Smokers / ex-smokers	41 (35%)	PPC risk factor

Table 2: Components of the early-physiotherapy intervention

Component	Description
Early ambulation	Out-of-bed activity from postoperative day 1, progressed
Breathing exercises	Deep breathing and lung-expansion techniques
Supported coughing	Secretion clearance with wound support
Progressive mobility	Graded walking distance and independence

RESULTS AND FINDINGS

Of the 118 randomised participants, the great majority completed the study. The early-physiotherapy group showed clear advantages across the primary and secondary outcomes, as illustrated in Figure 2.

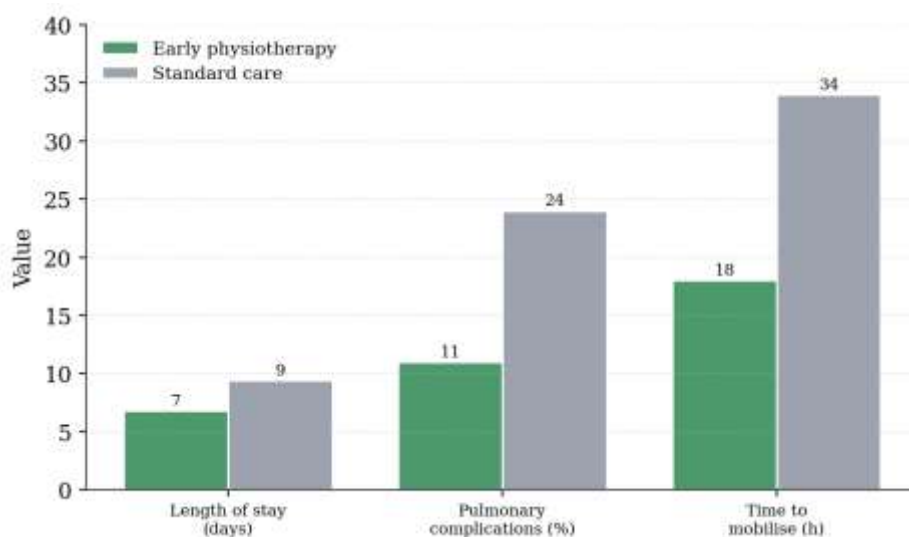


Figure 2: Hospital length of stay, pulmonary complications and time to mobilisation by group

The reduction in time to first mobilisation is likely to be a key driver of the other benefits, since earlier activity initiates the cascade of improved respiratory function, reduced complications and faster reconditioning that underlies recovery [4], [5]. In this sense, getting patients moving sooner can be regarded as the central mechanism through which the intervention exerts its effect.

Mean hospital length of stay was shorter in the early-physiotherapy group than in the standard-care group, and the incidence of postoperative pulmonary complications was substantially lower. Time to first mobilisation was also markedly earlier in the early-physiotherapy group. These findings are consistent with the established benefits of early mobilisation and respiratory physiotherapy in reducing complications and accelerating recovery [3], [4], [5].

Functional recovery, assessed by the six-minute walk distance, improved more rapidly in the early-physiotherapy group across the postoperative period (Figure 3). At each assessment, the early-physiotherapy group achieved greater walking distances than the standard-care group, and the difference was maintained through to the later assessments. This indicates that early physiotherapy not only reduced complications but also accelerated the recovery of functional capacity.

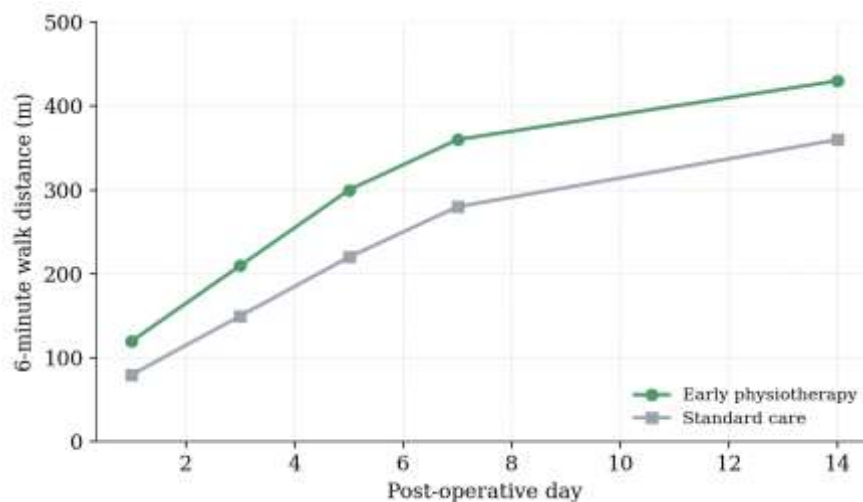


Figure 3: Recovery of walking capacity (six-minute walk distance) over the postoperative period

Feasibility is an important consideration alongside effectiveness, since an intervention that cannot be delivered within routine workflows will not be adopted regardless of its efficacy [4].

The smooth integration of the programme into standard postoperative care in this study suggests that it is practical for wider use.

Aggregate outcomes are summarised in Table 3. The early-physiotherapy programme was well tolerated, with no serious adverse events attributable to the intervention, and was feasible to deliver within routine postoperative care. These findings support both the effectiveness and practicality of early physiotherapy after major abdominal surgery.

Table 3: Outcomes by group

Outcome	Early	Standard	Difference
Length of stay (days)	6.8	9.4	-2.6
Pulmonary complications	11%	24%	-13
Time to mobilise (h)	18	34	-16
6-minute walk, day 14 (m)	430	360	+70

DISCUSSION

This randomised controlled study found that early physiotherapy rehabilitation following major abdominal surgery shortened hospital length of stay, reduced postoperative pulmonary complications, hastened mobilisation and accelerated functional recovery compared with standard care. These findings provide controlled evidence supporting the routine incorporation of early physiotherapy into postoperative care and align with the principles of enhanced-recovery pathways [4], [5].

The reduction in pulmonary complications is mechanistically coherent. Early ambulation and breathing exercises promote lung expansion, improve secretion clearance and counter the reduced lung volumes and diaphragmatic dysfunction that predispose to atelectasis and infection after abdominal surgery [2], [3]. The earlier mobilisation achieved in the intervention group both reflects and drives this benefit, as activity is central to restoring respiratory and overall function. The shorter length of stay is a logical consequence of fewer complications and faster recovery, with important implications for healthcare resources.

Functional recovery measured by walking capacity is a particularly meaningful outcome

because it reflects the patient's real-world ability to resume independent activity, rather than a purely physiological marker [6]. Its earlier restoration in the intervention group therefore signals a tangible benefit for patients beyond the reduction in clinical complications. The accelerated recovery of walking capacity demonstrates that early physiotherapy delivers patient-centred functional benefits beyond the prevention of complications. Faster restoration of mobility supports earlier return to independence and is increasingly recognised as a key outcome of perioperative care [6]. The maintenance of the between-group difference over time suggests a durable advantage rather than a transient effect. The practical significance is considerable, as the intervention used simple, low-cost components that are feasible to deliver in routine practice and applicable across surgical settings.

The consistency of benefit across distinct outcomes, namely pulmonary complications, length of stay, time to mobilisation and walking capacity, strengthens confidence that the intervention produced a genuine effect rather than influencing a single measure in isolation [4], [5]. Effects that converge across related outcomes are less likely to be artefacts of chance or measurement than an isolated positive finding would be.

Certain limitations should be acknowledged. The single-centre design limits generalisability, and the inherent difficulty of blinding participants and clinicians in an exercise intervention raises the possibility of performance and expectation effects. Length of stay can be influenced by factors beyond physiotherapy, including surgical and discharge practices, although randomisation should balance these. Some outcomes relied on clinical assessment, and adherence to mobilisation in both groups, while monitored, may have varied.

CONCLUSION

The simplicity and low cost of the intervention are notable strengths, since early ambulation and breathing exercises require minimal equipment and can be implemented widely, including in resource-limited settings [4], [5].

This randomised controlled study demonstrated that early physiotherapy rehabilitation following major abdominal surgery significantly shortened hospital length of stay, reduced postoperative pulmonary complications, hastened mobilisation and accelerated functional recovery compared with standard care. The intervention was safe, simple and feasible to

deliver, supporting its routine incorporation into postoperative care and the principles of enhanced recovery. While the single-centre design and difficulty of blinding warrant cautious interpretation, the consistency of benefit across complication, length-of-stay and functional outcomes provides strong support for early physiotherapy, and larger multicentre trials would further confirm and refine these findings.

LIMITATIONS

Several limitations should be noted. The study was conducted at a single centre, limiting generalisability to other settings and surgical populations. Blinding of participants and treating clinicians is inherently difficult in physiotherapy interventions, allowing potential performance and expectation effects. Hospital length of stay is influenced by factors beyond physiotherapy, including surgical complications, social circumstances and institutional discharge practices, which randomisation can balance but not eliminate. Some outcomes depended on clinical assessment, and the degree of mobilisation in the standard-care group, although reflecting usual practice, was not tightly controlled, potentially attenuating the observed difference.

FUTURE SCOPE

Future research should include larger multicentre randomised trials to confirm the effectiveness of early physiotherapy across diverse abdominal procedures and healthcare settings, and to identify which patients benefit most. Studies disentangling the relative contributions of early ambulation and respiratory techniques would help optimise the intervention, and economic evaluations would quantify the cost savings associated with reduced length of stay and complications. Longer-term follow-up assessing functional recovery and quality of life beyond discharge would strengthen the evidence base. Investigation of strategies to enhance early mobilisation, including the use of mobility technology and structured protocols, offers promising directions for improving postoperative recovery.

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Received Date: March 10, 2026

Accepted Date: April 10, 2026

Published Date: May 10, 2026

Citation: Dr. Anuradha Pillai, Vivek Saxena, Ritika Bose, Manoj Kumar. Effectiveness of Early Physiotherapy Rehabilitation Following Major Abdominal Surgery: Impact on Functional Recovery and Hospital Stay. *Journal of Physiotherapy in Medical and Surgical Conditions*. 2026; 2(1): 12-22p.