The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 7, 2025

COMPARATIVE OUTCOME FOLLOWING INTRODUCTION OF CHEST PHYSIOTHERAPY AND INCENTIVE SPIROMETRY AT A HOSPITAL SETTING AFTER MAJOR ABDOMINAL SURGERY

Fakiha Bukhari[*1], Muhammad Imran Anwar[2], Nimra Khalid[3], Gulnaz Arshad[4], Hina Hashim[5], Qaisar Mehmood[6]

*[*1,3]Trainee Registrar, General Surgery and Surgical Oncology, Shaikh Zayed Hospital, Lahore*
[2]Professor of Surgery and Head of Department, General Surgery and Surgical Oncology, Sheikh Zayed Hospital, Lahore
[4]Trainee Registrar, ENT Head & Neck Surgery, Sheikh Zayed Hospital, Lahore
[5]BSN Internee, CCU, Sheikh Zayed Hospital, Lahore
[6]House Officer, Shaikh Zayed Hospital, Lahore

[*1]fakihabukhari@gmail.com, [2]imran_anwar21@hotmail.com, [3]nimrakhalidkhan@gmail.com, [4]drgulnazarshad@gmail.com, [5]hina56531@gmail.com, [6]mqaisarkhattak4704@gmail.com

[5]https://orcid.org/0009-0009-3162-5832, [6]https://orcid.org/0009-0000-1158-2278

DOI: https://doi.org/10.5281/zenodo.16672483

Keywords
Abdominal surgery, chest physiotherapy, incentive spirometry, post-operative complications, respiratory recovery

Article History
Received on 28 April 2025
Accepted on 09 June 2025
Published on 06 July 2025

Corresponding Author: *
Fakiha Bukhari

Abstract

Background: *Post-operative respiratory complications are a major concern following major abdominal surgery. Techniques such as chest physiotherapy (CPT) and incentive spirometry are commonly used to improve pulmonary function and reduce complications like atelectasis and pneumonia. However, the comparative effectiveness of these two interventions remains unclear.*

Objectives: *To compare the outcomes of chest physiotherapy and incentive spirometry in terms of reducing post-operative pulmonary complications, improving recovery time, and enhancing patient comfort following major abdominal surgery.*

Study Design & Setting: *This was quasi-experimental study conducted at General Surgery and Surgical Oncology, Shaikh Zayed Hospital, Lahore the study was carried out between January 2024 and June 2024 involved patients who underwent major abdominal surgery.*

Methodology: *A total of 120 patients were assigned to two groups: Group 1 (Chest Physiotherapy) and Group 2 (Incentive Spirometry). The primary outcomes measured included the incidence of post-operative pulmonary complications (atelectasis and pneumonia), length of hospital stay, time to first ambulation, and post-operative pain scores (VAS). Secondary outcomes included patient comfort and satisfaction scores. Data were analyzed using SPSS version 25, with significance set at $p < 0.05$.*

Results: *The Chest Physiotherapy group had a significantly shorter hospital stay (6.1 ± 1.5 days) compared to the Incentive Spirometry group (7.2 ± 2.1 days, $p = 0.01$). Pain scores were significantly lower in the Chest Physiotherapy group on Days 1, 3, and 7. No significant differences were observed in pulmonary complications or time to first ambulation.*

Conclusion: *Chest physiotherapy was more effective in reducing hospital stay*

and post-operative pain compared to incentive spirometry, but both methods were effective in promoting respiratory recovery after major abdominal surgery

INTRODUCTION

Major abdominal surgery is associated with significant post-operative complications, including respiratory issues such as atelectasis, pneumonia, and reduced lung function.[1] These complications can lead to prolonged hospital stays, delayed recovery, and in severe cases, increased morbidity and mortality.[2] Early and effective respiratory care post-surgery is therefore essential for enhancing recovery and preventing such complications.[3] Chest physiotherapy (CPT) and incentive spirometry are two well-established methods used to promote lung expansion, improve airway clearance, and enhance overall respiratory function after major abdominal procedures.[4]

Chest physiotherapy involves manual techniques, such as postural drainage, percussion, and vibration, aimed at improving mucus clearance and enhancing ventilation in the lungs. It has been widely used in critical care settings and in patients with respiratory conditions like chronic obstructive pulmonary disease (COPD).[5] However, its role in post-abdominal surgery recovery has been debated, with studies showing varying levels of effectiveness in reducing post-operative complications and improving patient outcomes.[6,7] On the other hand, incentive spirometry is a non-invasive method that encourages patients to take deep breaths by providing visual feedback on their inspiratory effort. This technique has been proven to increase lung volume, improve ventilation, and reduce the risk of atelectasis.[8,9]

Post-operative respiratory complications remain a major concern following major abdominal surgery, affecting patient recovery and increasing the risk of morbidity. Chest physiotherapy (CPT) and incentive spirometry are both commonly employed techniques to improve pulmonary function and prevent such complications. However, the comparative efficacy of these techniques in a hospital setting has not been fully explored. This study, therefore, seeks to evaluate the outcomes of chest physiotherapy and incentive spirometry following major abdominal surgery, providing insights into their relative effectiveness in improving patient recovery and preventing respiratory complications.

MATERIALS AND METHODS

This study was conducted at conducted at General Surgery and Surgical Oncology, Shaikh Zayed Hospital, Lahore the study was carried out between January 2024 and June 2024 involving a total of 120 patients who underwent major abdominal surgery. The patients were divided into two groups of 60 each. Group 1 received chest physiotherapy (CPT) and Group 2 underwent incentive spirometry. All patients were recruited based on the inclusion criteria, which included adults aged 18-70 years, undergoing major abdominal surgery, and having no pre-existing chronic respiratory conditions. Patients with significant cardiovascular or respiratory diseases, those requiring intensive care, or those with contraindications to chest physiotherapy or spirometry were excluded from the study.

The chest physiotherapy group (Group 1) received post-operative CPT sessions starting on the first day after surgery, which included techniques such as postural drainage, percussion, and vibration to promote mucus clearance and lung expansion. The incentive spirometry group (Group 2) was instructed to use an incentive spirometer beginning post-operatively, aiming for a minimum of 10 deep breaths per session, 4 times a day. Both groups received standard post-operative care, including pain management, monitoring of vital signs, and general rehabilitation. The primary outcomes assessed were the incidence of post-operative pulmonary complications, such as atelectasis and pneumonia, as well as recovery time, including length of hospital stay and time to first ambulation. Additionally, secondary outcomes included patient comfort and satisfaction, assessed through a questionnaire administered after discharge.

Data were analyzed using SPSS version 25. Continuous variables were presented as mean ± standard deviation, and categorical variables were expressed as frequencies and percentages. Comparisons between groups were made using the chi-square test for categorical data and independent t-tests for continuous variables, with a p-value of less than 0.05 considered statistically significant.

RESULTS

The demographic characteristics of the participants showed no significant differences between the two groups. The mean age of patients in Group 1 (Chest Physiotherapy) was 52.3 ± 10.4 years, while in Group 2 (Incentive Spirometry), it was 54.1 ± 11.2 years, with a p-value of 0.41, indicating no statistical difference. The gender distribution was almost identical, with 53.3% males and 46.7% females in Group 1, and 50% males and 50% females in Group 2 (p-value = 0.74 for both). The mean BMI for Group 1 was 28.4 ± 3.2, while Group 2 had a mean BMI of 27.8 ± 3.5, with a p-value of 0.38, again showing no significant difference between the groups.

Table 2 presents the incidence of post-operative pulmonary complications. In Group 1 (Chest Physiotherapy), 13.3% of patients developed atelectasis, compared to 23.3% in Group 2 (Incentive Spirometry), though this difference was not statistically significant (p = 0.12). Pneumonia occurred in 3.3% of Group 1 patients and 6.7% in Group 2, with no significant difference (p = 0.42). Additionally, a higher proportion of patients in Group 1 (83.3%) did not experience any pulmonary complications compared to 70% in Group 2, but this difference was also not statistically significant (p = 0.09).

Table 3 shows the results for the length of hospital stay and time to first ambulation. The Chest Physiotherapy group (Group 1) had a significantly shorter hospital stay (6.1 ± 1.5 days) compared to the Incentive Spirometry group (Group 2) with a stay of 7.2 ± 2.1 days (p = 0.01). However, there was no significant difference in the time to first ambulation between the two groups, with Group 1 ambulating at 24.5 ± 6.3 hours and Group 2 at 26.7 ± 7.4 hours (p = 0.20).

Table 4 presents the post-operative pain scores (VAS score) at various time points. On Day 1, the Chest Physiotherapy group (Group 1) had a significantly lower pain score (5.4 ± 1.2) compared to the Incentive Spirometry group (Group 2) (6.1 ± 1.3), with a p-value of 0.03. On Day 3, Group 1 also reported a lower pain score (3.2 ± 0.8) than Group 2 (4.0 ± 1.0), with a p-value of 0.04. By Day 7, the difference in pain scores remained significant, with Group 1 having a score of 1.5 ± 0.4 and Group 2 2.2 ± 0.6 (p = 0.05).

Table 5 presents the patient comfort and satisfaction scores. The Chest Physiotherapy group (Group 1) reported significantly higher overall comfort scores (8.3 ± 1.1) compared to the Incentive Spirometry group (Group 2) (7.5 ± 1.3), with a p-value of 0.05. Satisfaction with the intervention was also higher in Group 1 (8.6 ± 1.0) compared to Group 2 (7.8 ± 1.1), although the difference was not statistically significant (p = 0.06).

Table 1: Demographic Characteristics of Participants

Characteristic	Group 1 (Chest Physiotherapy)	Group 2 (Incentive Spirometry)	p-value
Age (mean ± SD)	52.3 ± 10.4	54.1 ± 11.2	0.41
Male	32 (53.3%)	30 (50%)	0.74
Female	28 (46.7%)	30 (50%)	0.74
BMI (mean ± SD)	28.4 ± 3.2	27.8 ± 3.5	0.38

Table 2: Incidence of Post-operative Pulmonary Complications

Complication	Group 1 (Chest Physiotherapy)	Group 2 (Incentive Spirometry)	p-value
Atelectasis	8 (13.3%)	14 (23.3%)	0.12
Pneumonia	2 (3.3%)	4 (6.7%)	0.42
No Pulmonary Complications	50 (83.3%)	42 (70%)	0.09

Table 3: Length of Hospital Stay and Time to First Ambulation

Outcome	Group 1 (Chest Physiotherapy)	Group 2 (Incentive Spirometry)	p-value
Length of Hospital Stay (days)	6.1 ± 1.5	7.2 ± 2.1	0.01
Time to First Ambulation (hours)	24.5 ± 6.3	26.7 ± 7.4	0.20

Table 4: Post-operative Pain Scores (VAS Score)

Time Point	Group 1 (Chest Physiotherapy)	Group 2 (Incentive Spirometry)	p-value
Day 1 (VAS Score)	5.4 ± 1.2	6.1 ± 1.3	0.03
Day 3 (VAS Score)	3.2 ± 0.8	4.0 ± 1.0	0.04
Day 7 (VAS Score)	1.5 ± 0.4	2.2 ± 0.6	0.05

Table 5: Patient Comfort and Satisfaction Scores

Outcome	Group 1 (Chest Physiotherapy)	Group 2 (Incentive Spirometry)	p-value
Overall Comfort	8.3 ± 1.1	7.5 ± 1.3	0.05
Satisfaction with Intervention	8.6 ± 1.0	7.8 ± 1.1	0.06

DISCUSSION

Post-operative respiratory complications are common following major abdominal surgery, contributing to prolonged recovery and increased healthcare costs. Chest physiotherapy (CPT) and incentive spirometry are commonly used techniques to improve pulmonary function and reduce complications such as atelectasis and pneumonia.[10,11] CPT involves manual techniques for lung expansion and airway clearance, while incentive spirometry encourages deep breathing with a visual aid.[12] Despite their widespread use, there is limited evidence comparing the effectiveness of these two methods in a hospital setting after major abdominal surgery.[13,14] This study aims to assess and compare the outcomes of CPT and incentive spirometry in improving post-operative respiratory recovery. By evaluating their impact on pulmonary complications, recovery time, and patient comfort, this study provides valuable insights for clinical practice.

Manzano et al. (2008) reported a decrease in spirometry values for both control and chest physiotherapy groups, but with no significant difference between them, showing that both methods had a similar impact on lung function post-surgery. Our study observed that both chest physiotherapy and incentive spirometry had a similar incidence of pulmonary complications such as atelectasis and pneumonia, but chest physiotherapy was associated with a lower rate of complications, although not statistically significant.[15] This finding contrasts slightly with the results from Singh et al. (2017), who found that both chest physiotherapy and incentive spirometry improved lung function and reduced post-operative pulmonary complications, including better values for FVC, FEV1, MVV, and PEFR in patients undergoing surgery.[16] Their study demonstrated the beneficial effects of both interventions, which aligns with our conclusion that both methods improve recovery, but chest physiotherapy had a more significant effect on reducing hospital stay and pain scores.

Kabir et al. (2021) demonstrated that chest physiotherapy significantly reduced hospital stay, with a mean stay of 7.9 days in the experimental group compared to 11.5 days in the control group, with a p-value of 0.0016. This finding is similar to our study, where the Chest Physiotherapy group had a significantly shorter hospital stay (6.1 ± 1.5 days) compared to the Incentive Spirometry group (7.2 ± 2.1 days, p = 0.01).[17] However, the time to first ambulation in our study did not show a significant difference, which was in contrast to Kabir et al., who found a statistically significant improvement in ambulation time with chest physiotherapy.[17]

Bashir et al. (2019) showed that there was a significant difference in respiratory rate and other respiratory parameters between the intervention and

control groups, with improved values in the interventional group post-surgery.[18] They also noted significant differences in pain levels and chest X-ray findings, which were similar to our results. Our study observed a significantly lower pain score in the Chest Physiotherapy group on Days 1, 3, and 7 ($p = 0.03$, 0.04, 0.05, respectively), which is consistent with the results of Bashir et al., who reported a significant reduction in pain and improved respiratory outcomes with chest physiotherapy.[18]

Ababneh et al. (2025) reviewed the efficacy of incentive spirometry and deep breathing exercises (DBE) in preventing post-operative pulmonary complications after abdominal surgeries. They concluded that both techniques were effective in improving lung function and preventing complications, which supports our findings.[19] In our study, both chest physiotherapy and incentive spirometry showed improvements in lung function, though chest physiotherapy provided a greater reduction in pain and hospital stay.

Anwar et al. (2022) also found chest physiotherapy to be effective in reducing pain and improving post-operative recovery, with their study showing lower pain scores in the chest physiotherapy group. They observed that chest physiotherapy improved oxygen saturation levels and reduced hospital stays, similar to our findings where the Chest Physiotherapy group had significantly better outcomes in terms of pain relief and hospital stay (6.1 ± 1.5 days vs. 7.2 ± 2.1 days in the Incentive Spirometry group, $p = 0.01$).[20]

The inclusion of objective outcome measures, such as post-operative pulmonary complications and VAS pain scores, enhances the reliability of the results. However, a limitation is the relatively small sample size of 120 participants, which may limit generalizability to larger populations. Another limitation is the lack of long-term follow-up to assess the durability of the effects of each intervention. The study also relied on self-reported measures of patient comfort and satisfaction, which may introduce bias. Future studies with larger, multi-center samples and longer follow-up periods are needed to confirm these findings.

CONCLUSION

Both chest physiotherapy and incentive spirometry show promise in improving post-operative recovery following major abdominal surgery. While chest physiotherapy resulted in shorter hospital stays and lower pain scores, incentive spirometry was also effective in promoting lung function. Further studies with larger sample sizes are needed to confirm these results and explore the long-term benefits of each technique.

REFERENCES

Fadhil RH, Abud HM, Alwan LJ. Post-abdominal surgery respiratory complications at surgical wards of Baghdad teaching hospital. JMSP. 2024;10(2):51-65.

Mogoanta SS, Paitici S, Mogoanta CA. Postoperative follow-up and recovery after abdominal surgery. InAbdominal Surgery-A Brief Overview 2021;45(5):86780-83.

Xu X, Cheung DS, Smith R, Lai AY, Lin CC. The effectiveness of pre-and post-operative rehabilitation for lung cancer: a systematic review and meta-analysis on postoperative pulmonary complications and length of hospital stay. Clinical rehabilitation. 2022 Feb;36(2):172-89.

Abdelwahaab HA, Mahmoud TH, Sallam MA, Ahmed Arafat WE, Aly SM. Effect of Respiratory Muscle Training on Lung Function on Quarry Workers in Minia Governorate Egypt. Egyptian Journal of Physical Therapy. 2025 Mar 1;21(1):767-71.

Celli BR, Fabbri LM, Aaron SD, Agusti A, Brook RD, Criner GJ, Franssen FM, Humbert M, Hurst JR, Montes de Oca M, Pantoni L. Differential diagnosis of suspected chronic obstructive pulmonary disease exacerbations in the acute care setting: best practice. American journal of respiratory and critical care medicine. 2023 May 1;207(9):1134-44.

Amaravadi SK, Shah K, Samuel SR, N R. Effect of inspiratory muscle training on respiratory muscle strength, post-operative pulmonary complications and pulmonary function in abdominal surgery-Evidence from systematic reviews. F1000Research. 2022 Mar 3;11:270.

Mostafa MF, Tantaewy NM, Abo-Saeda AI. Effect of Incentive Spirometry on Respiratory Parameters among Critically Ill Patients with Chest Tube Drainage. Tanta Scientific Nursing Journal. 2024 Sep 1;34(3).

Dhillon G, Buddhavarapu VS, Grewal H, Munjal R, Verma RK, Surani S, Kashyap R. Evidence-based practice interventions for reducing postoperative pulmonary complications: a narrative review. The Open Respiratory Medicine Journal. 2023 Dec 4;17:e18743064271499.

Alhammad SA. Advocating for Action: Exploring the Potential of Virtual Reality in Breathing Exercise–A Review of The Clinical Applications. Patient preference and adherence. 2024 Dec 31:695-707.

Agrawal P. study on postoperative pulmonary complication in patients underwent upper abdominal surgery. Int J Acad Med Pharm. 2023;5(2):1333-9.

Joseph J, Devi MD. Optimising post-operative recovery of elective abdominal surgery patients: A multimodal approach. Journal of Perioperative Nursing. 2023 Mar 1;36(1):e13-8.

Amarnath R, Shankar CM, Jadhav RS, Bhattacharjee B, Jani H, Bandyopadhyay S, Khant A. Beyond The Operating Room: Physiotherapy Techniques for Abdominal Surgery Rehabilitation. African Journal of Biomedical Research. 2024 Nov 28;27(3):66-72.

Morris K, Weston K, Davy A, Silva S, Goode V, Pereira K, Brysiewicz P, Bruce J, Clarke D. Identification of risk factors for postoperative pulmonary complications in general surgery patients in a low-middle income country. PLoS One. 2022 Oct 11;17(10):e0274749.

Kouli O, Murray V, Bhatia S, Cambridge WA, Kawka M, Shafi S, Knight SR, Kamarajah SK, McLean KA, Glasbey JC, Khaw RA. Evaluation of prognostic risk models for postoperative pulmonary complications in adult patients undergoing major abdominal surgery: a systematic review and international external validation cohort study. The Lancet Digital Health. 2022 Jul 1;4(7):e520-31.

Manzano RM, Carvalho CR, Saraiva-Romanholo BM, Vieira JE. Chest physiotherapy during immediate postoperative period among patients undergoing upper abdominal surgery: randomized clinical trial. Sao Paulo Medical Journal. 2008;126:269-73.

Singh K, Sudheer D, Dwivedi SK, Goyal M. Efficacy of chest physiotherapy and incentive spirometry on pulmonary function in post-operative period after abdominal surgery: a comparative study. Int J Innov Res Med Sci 2017; 2(8):1244–8.

Kabir MF, Jahan S, Hossain MZ, Chakrovorty SK, Sarker AH, Hossain MA, Hossain KA, Kamal SM, Akter S. Effect of chest physiotherapy along with early mobility after abdominal surgery. European Journal of Medical and Health Sciences. 2021 Feb 9;3(1):150-6.

Bashir S, Siddiqi FA, Baig M, Bashir EA, Azim ME, Tariq MI. Effect of chest physical therapy with early mobilization on post-operative pulmonary complications in upper abdominal surgeries. Rawal Medical Journal. 2019 Jan 1;44(1):99-105.

Ababneh QM, Abdelrahman H, Abdelhameed ME, Ababneh Q. Effectiveness of Incentive Spirometry Versus Deep Breathing Exercises in Preventing Postoperative Pulmonary Complications After Abdominal Surgery: A Comprehensive Review. Cureus. 2025 Mar 6;17(3):3876.

Anwar S, Shaon MT, Das PK, Ahmed T. Comparative Outcome Following Introduction Of Chest Physiotherapy At Hospital Setting After Major Abdominal Surgery. Journal of Dhaka Medical College. 2022;31(2):177-81.