Respiratory physiotherapy to prevent pulmonary complications after abdominal surgery: a systematic review
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CRD summary
The authors concluded that current evidence does not appear to justify routine prophylactic respiratory physiotherapy after abdominal surgery. The quality of the primary studies was suboptimal and the review had some limitations with respect to the search and the reported study selection process. However, the review was generally well-conducted and these conclusions seem likely to be reliable.

Authors' objectives
To evaluate the use of respiratory physiotherapy for the prevention of pulmonary complications after abdominal surgery.

Searching
MEDLINE, EMBASE, CINAHL and the Cochrane CENTRAL Register were searched to November 2005; the search terms were reported. The reference lists of retrieved articles were checked. The review was limited to studies reported in full. There were no language restrictions.

Study selection
Randomised controlled trials (RCTs) of prophylactic respiratory physiotherapy in patients undergoing open abdominal surgery were eligible for inclusion. Studies were required to compare any type of prophylactic respiratory physiotherapy with no intervention (primary comparison) or with a different type of prophylactic respiratory physiotherapy (active control). They were also required to report one of the following outcomes: pneumonia (primary outcome), atelectasis, post-operative pulmonary complications, oxygenation or vital capacity. Eligible studies had to assess the outcomes over at least 2 days. Adverse effects attributable to physiotherapy were also of interest. Studies of therapeutic physiotherapy were excluded.

The included studies evaluated at least 15 different physiotherapy treatments and treatment combinations, including incentive spirometry, continuous positive airway pressure (CPAP), intermittent positive pressure breathing (IPPB), and various types of physical therapy (e.g. deep breathing, directed cough, postural drainage) among adult patients. The interventions were administered for a mean of 4 days (range: 1 to 9) after a variety of abdominal surgical procedures (including upper and lower abdominal surgery, hysterectomy, cholecystectomy, inguinal hernia, gastric and biliary procedures). The included studies used a wide range of definitions for pulmonary complications, including symptoms of acute bronchitis, pneumonia or atelectasis, or combinations of these. Complications were ascertained in most cases by clinical or radiological means. The outcomes were assessed over a mean observation period of 5 days (range: 2 to 15).

The lead author appears to have selected the studies.

Assessment of study quality
The following quality criteria were considered: method of randomisation and allocation concealment, blinding and completeness of follow up.

One reviewer performed the quality assessment, which two other reviewers independently checked. Any disagreements were resolved by discussion.

Data extraction
Risk differences (RDs) were calculated from event rates in the two groups, with 95% confidence intervals (CIs). Where findings were significant, numbers-needed-to-treat (NNTs) were also calculated. Data from the longest duration of follow-up were reported in the review. Study authors were contacted to request extra data.
One reviewer extracted the data, which two other reviewers independently checked. Any disagreements were resolved by discussion.

Methods of synthesis
Study results were tabulated and combined in a narrative, grouped by comparison and outcome. Heterogeneity was assessed by plotting event rates on a scatter chart, while potential sources of heterogeneity were discussed in the text.

Results of the review
Thirty-five RCTs (n=4,145) were included in the review.

Study quality was limited. Only 11 RCTs reported using a satisfactory method of randomisation, 5 described allocation concealment, 16 blinded observers, and follow-up was complete in 13. Many trials were small and underpowered, and none provided full details about the intervention (e.g. patient position)

Prophylactic respiratory physiotherapy versus no intervention (13 RCTs, n=1,411).

Pneumonia (6 RCTs): one RCT, with a pneumonia rate of 37% in the control group, found a statistically significant benefit for the intervention group who received deep breathing, directed cough and postural drainage (RD 23.6%, 95% CI: 7, 40; NNT 4, 95% CI: 3, 14). The other 5 RCTs, which had pneumonia rates of 2 to 5% in controls, found no significant difference between the groups.

Atelectasis (9 RCTs): 2 RCTs, with atelectasis rates of 39% and 77% in the control groups, found a statistically significant benefit for the intervention group who received deep breathing and directed cough, with or without postural drainage (RD 24%, 95% CI: 5, 43; NNT 4, 95% CI: 2, 18; and RD 18%, 95% CI: 5, 31; NNT 6, 95% CI: 3, 19). The other 7 RCTs, which had rates of 20 to 25% in controls, found no significant difference between the groups.

Unspecified pulmonary complications (8 RCTs): one four-arm RCT found a statistically significant benefit for the three intervention groups who received incentive spirometry, deep breathing and directed cough, or IPPB (RD 25.5 to 26.3%; NNT 4). The other RCTs found no significant difference between the groups. There was marked heterogeneity in event rates in both groups for this outcome, with incidence rates of complications ranging for 0 to 50%.

Oxygenation (5 RCTs) and vital capacity (3 RCTs): no significant differences were reported between the groups for these outcomes.

Prophylactic respiratory physiotherapy versus active control (22 RCTs, n=2,734).

No RCTs reported a significant difference between the groups in rates of pneumonia or atelectasis. Five RCTs reported significant differences in vital capacity (4 RCTs), unspecified pulmonary complications (one RCT) and/or oxygenation (one RCT); their findings favoured a range of different interventions.

Adverse effects.
Reported adverse effects included intolerable abdominal discomfort associated with bilevel positive airway pressure (15% and 29% of patients, respectively, in 2 RCTs), claustrophobia and nose ulcers with CPAP (9% and 4%, respectively, in one study), abdominal distension with IPPB (18% in one RCT) and incisional hernia during chest physiotherapy in a single patient in one RCT. Four trials noted that no adverse events had occurred and 26 did not mention adverse events.

Authors’ conclusions
Current evidence does not appear to justify the routine use of prophylactic respiratory physiotherapy after abdominal surgery.

CRD commentary
The review objectives and inclusion criteria were clear. Relevant sources were searched for studies, although the
exclusion of published abstracts means that some potentially relevant data were missed. Whilst it is unclear whether unpublished studies were excluded, there does not appear to have been any attempts to locate such studies. Publication bias was not apparently assessed. Steps were taken to minimise the potential for bias and error in the data extraction and validity assessment by having more than one reviewer independently make decisions, but it is unclear whether this also applied to the study selection process. Relevant quality criteria were considered, the better-quality evidence was highlighted, and heterogeneity between the studies was well addressed in the text. The quality of the primary studies was suboptimal and the review had some limitations with respect to the search and the reported study selection process. However, the review was in most respects well-conducted and the authors' conclusions seem likely to be reliable.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that well-powered RCTs are required to determine whether prophylactic respiratory physiotherapy can be recommended routinely after abdominal surgery. Future studies should include a placebo or no-intervention control group and the primary outcome should be pneumonia. The intervention should be administered by trained physiotherapists and be identical in all participants, as should associated procedures such as analgesia. Additional implications for research were noted in the paper.

**Funding**

Not stated.

**Bibliographic details**


**PubMedID**

17167013

**DOI**

10.1378/chest.130.6.1887

**Original Paper URL**


**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Abdomen /surgery; Humans; Physical Therapy Modalities; Pneumonia /prevention & control; Postoperative Complications /prevention & control; Pulmonary Atelectasis /prevention & control; Randomized Controlled Trials as Topic; Respiration, Artificial; Respiratory Insufficiency /prevention & control; Treatment Outcome

**AccessionNumber**

12007000276

**Date bibliographic record published**

06/12/2007

**Date abstract record published**

01/12/2008

**Record Status**

This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on
the reliability of the review and the conclusions drawn.