Clinical Strategies to Reduce Utilization of Chest Physiotherapy Without Compromising Patient Care*

Ed Alexander, MD; Scott Weingarten, MD, MPH; and Zab Mohsenifar, MD

Background: There is widespread interest in the evaluation of clinical strategies that safely reduce health-care costs. Elimination of inappropriate chest physiotherapy may represent one of those strategies.

Setting: An academic community hospital.

Methods: One-hundred one patients receiving chest physiotherapy were prospectively randomized to continue their chest physiotherapy or to inform their physicians that the order for the chest physiotherapy may have been inappropriate.

Results: Patients who were randomized to receive chest physiotherapy discontinued received 45% fewer chest physiotherapy treatments than control patients (p<0.01). There was no increase in the mortality rate of length of hospital stay associated with the reduction in chest physiotherapy in carefully selected patients. The estimated cost savings would be $319,000, which is 50 times greater than the cost associated with the intervention.

Conclusion: Chest physiotherapy is frequently provided to patients for inappropriate indications. Reducing chest physiotherapy for these patients may significantly reduce respiratory therapy costs without increasing length of stay or mortality rates. (CHEST 1996; 110:430-32)

Key words: chest physiotherapy; health-care delivery; respiratory therapy

There is a current imperative in health care to reduce health-care costs while improving quality of patient care. Interventions designed to accomplish these goals must address clinical decision making. However, research studies have documented the difficulty of producing sustained changes in physician practice.1 Strategies that use scientific evidence and are acceptable to physicians may prove most effective in changing clinical practice and improving patient care.

Previous studies have shown that use of clinical guidelines can reduce respiratory therapy services without impairing any clinical outcome.2,3 One such strategy was initiated in our institution with respect to the utilization of chest physiotherapy. At Cedars-Sinai Medical Center, approximately 60,000 chest physiotherapy procedures are delivered on an annual basis at a cost of $19.52 per procedure at a total cost of $1.17 million. Our initial audit suggested that we might be able to eliminate significant number of chest physiotherapy procedures in the setting where it may not be appropriately indicated. Moreover, we hypothesized that we would reduce costs associated with chest physiotherapy without compromising patient care.

Materials and Methods

We did a 30-year review of the literature to find evidence that would support appropriate indications for chest physiotherapy.4-10 We found the following indications had sufficiently strong support in the literature for chest physiotherapy: (1) patients who produce copious amounts of sputum (>30 mL/24h) and need assistance in clearing secretions; (2) patients diagnosed as having atelectasis that is segmental or greater; (3) lung abscess; (4) bronchiectasis; and (5) cystic fibrosis.11-13 We did not find strong evidence to support use of chest physiotherapy in simple pneumonia, pleural effusion, and/or chronic uncomplicated obstructive lung disease.14-18 We then did an internal audit of 50 patient charts with orders for chest physiotherapy. Each chart was reviewed by two physicians. In 16 of the patients, we found appropriate indications for chest physiotherapy, while in 34, we did not. This audit suggested the potential of cost savings of approximately $600,000 to $700,000/yr in our institution. Using a social influence-based model, we designed a study that could affect the physician behavioral pattern. The study was approved by the Institutional Review Board at Cedars-Sinai Medical Center.

Intervention

Within 24 to 48 h after the Respiratory Therapy Department received a request for chest physiotherapy, patients’ charts were reviewed by two physicians, and patients with appropriate indications for chest physiotherapy, as defined above, were excluded from this study. All other patients were randomized into the control or intervention groups. In the intervention group, physicians were...
Results

One hundred seventy-seven patients from medical and surgical wards were enrolled in the study. Seventy-two patients were excluded because of the following indications: atelectasis (segmental or greater) (27), lung abscess (2), bronchiectasis (3), obstructive lung disease with copious amounts of sputum (9), chest trauma with lobar collapse (18), cystic fibrosis (12), and miscellaneous (1). One hundred five patients were randomized in the study (Fig 1). Forty-eight patients were from surgical and 57 were from medical wards. No physicians refused to enroll their patients in the study. Of these, we were able to collect data in 101 (4 patients were transferred to outside institutions and we were unable to collect adequate information) (Fig 1). Table 1 shows outcome data in 101 patients enrolled in the study. In 47 of these patients, chest physiotherapy was discontinued within 4 to 6 h of the telephone contact by the physician fellow; 54 patients continued receiving chest physiotherapy. There was no significant difference in mean age, comorbidity, or length of stay between the two groups (Table 1). In addition, there was no increase in the use of hand-held nebulizers or incentive spirometry in these patients. The number of chest physiotherapy procedures received was significantly lower in the group in whom chest physiotherapy was discontinued (1,566 procedures vs 752). This reduction was from 29 to 16 chest physiotherapy treatments per patient (p<0.01). Patient mortality rate and length of stay were not significantly different between the groups (Table 1).

Approximate cost of chest physiotherapy in our institution is $19.52. This includes direct cost (respiratory therapist’s time) and indirect cost (equipment and overhead). Projected cost savings would be as follows. If we were to eliminate all of the inappropriate chest physiotherapy procedures, we would save approximately $680,000. If we were to eliminate chest physiotherapy procedures only in the intervention group, the cost savings would be $319,000. Because the intervention group received chest physiotherapy during the initial period of their hospitalization, the cost savings related to partial elimination of chest physiotherapy procedures would be $176,000.

Discussion

There have been numerous studies on the effectiveness of chest physiotherapy over the last 30 years. Commonly accepted indications that were approved by Blue Shield of California and endorsed by the American College of Physicians include bronchitis/emphysema, bronchiectasis, lung abscess, postoperative

Table 1—Patient Outcome Data in Group 1 and Group 2

<table>
<thead>
<tr>
<th></th>
<th>Group 1 Nonintervention (n=54)</th>
<th>Group 2 Intervention (n=47)</th>
<th>Difference (95% CI)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, yr</td>
<td>69±14</td>
<td>65±23</td>
<td>4 (-3 to 11)</td>
<td>NS</td>
</tr>
<tr>
<td>Comorbidity</td>
<td>6.71±2.34</td>
<td>5.7±3.30</td>
<td>1.01 (-0.8 to 2.8)</td>
<td>NS</td>
</tr>
<tr>
<td>Length of stay, d</td>
<td>11.8±2</td>
<td>11.2±2</td>
<td>0.6 (-1.2 to 2.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Mortality, %</td>
<td>9</td>
<td>6</td>
<td>3 (-7 to 13)</td>
<td>NS</td>
</tr>
<tr>
<td>Chest physiotherapy/patient (No. of procedures)</td>
<td>29±4</td>
<td>16±3</td>
<td>13 (11 to 15)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*CI=confidence interval; NS=not significant.
atelectasis (segmental or greater), resolving status asthmaticus, smoke inhalation or other chemical trauma to the lung or upper airway, cystic fibrosis following foreign body extraction, and bronchopulmonary dysplasia. Scientific studies examining the efficacy of chest physiotherapy in randomized control trials are limited. For example, there is no evidence that chest physiotherapy plays a beneficial role in chronic obstructive lung disease. Mollesen et al studied the role of chest physiotherapy and mechanical vibration in a randomized study and found no change in gas exchange or spirometric values 20 or 40 min after chest physiotherapy or mechanical vibration. Wollmer showed that in patients in stable condition with chronic bronchitis or patients with acute exacerbation of chronic bronchitis, chest physiotherapy did not play a role in the improvement and/or outcome of these patients. One of the areas in which chest physiotherapy is commonly ordered is in patients with pneumonia. Holody and Goldberg, in a nonrandomized study, showed an improvement in arterial oxygen tension after 30 min of mechanical vibration of the thorax. However, Britton et al did a randomized trial that compared chest physiotherapy with no chest physiotherapy, and found that patients in both groups had comparable outcomes. One additional area of interest is that chest physiotherapy might be dangerous in acutely ill patients. Connors et al studied the immediate effect of chest physiotherapy in 22 hospitalized patients with a variety of chronic obstructive lung diseases and pneumonia and found there was a significant increase in respiratory distress accompanied by a decrease in PaO₂ after chest physiotherapy in up to 50% of these patients.

Our study demonstrates that using our criteria, greater than 50% of chest physiotherapy treatments were ordered in our institution for inappropriate indications. Based on the results of our study, the Respiratory Therapy Department implemented a hospital-wide protocol to limit delivery of chest physiotherapy to patients with appropriate indications as noted previously. A simple intervention of advising physicians of both appropriate and inappropriate indications for chest physiotherapy resulted in a significant reduction in utilization of chest physiotherapy, with an approximate projected savings of $680,000/yr. In fact, the projected cost savings associated with this intervention (eliminating all chest physiotherapy procedures in the intervention group) would be $310,000. The cost of the time devoted by the physician fellow to the project, was estimated to be less than $6,000/yr. Therefore, the cost savings afforded by the intervention was approximately 50 times the cost of the intervention. Moreover, this reduction was not associated with an increase in mortality and/or length of stay.

In conclusion, our study suggests that a single telephone consult by a physician fellow is an effective and simple intervention that changed physician behavior and reduced the frequency of inappropriate chest physiotherapy. This method should be evaluated against other strategies to change clinical practice.

ACKNOWLEDGMENTS: The authors thank Lisa Rubenstein, MD, Brian Mittman, PhD, Andy Lantano, and Gilbert Felicia.

REFERENCES
7 Graham WG. Efficacy of chest physiotherapy and intermittent positive-pressure breathing in the resolution of pneumonia. N Engl J Med 1979; 299:624-27
11 Blue Shield of California. Respiratory therapy: Physicians Newsletter 1983; 1242:4-9
18 MacMahon C. Breathing and physical exercises for use in cases of wounds in the pleura, lung and diaphragm. Lancet 1915; 2:769-70