Complete Summary

GUIDELINE TITLE

Medical and surgical treatment of parapneumonic effusions: an evidence-based guideline.

BIBLIOGRAPHIC SOURCE(S)

Colice GL, Curtis A, Deslauriers J, Heffner J, Light R, Littenberg B, Sahn S, Weinstein RA, Yusen RD. Medical and surgical treatment of parapneumonic effusions: an evidence-based guideline. Chest 2000 Oct;118(4):1158-71. [41 references]

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
EVIDENCE SUPPORTING THE RECOMMENDATIONS
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
QUALIFYING STATEMENTS
IMPLEMENTATION OF THE GUIDELINE
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES
IDENTIFYING INFORMATION AND AVAILABILITY

SCOPE

DISEASE/CONDITION(S)

Parapneumonic effusion

GUIDELINE CATEGORY

Management
Treatment

CLINICAL SPECIALTY

Pulmonary Medicine
Thoracic Surgery

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

Primary Objective:

- To develop a clinical practice guideline on the evaluation and management of parapneumonic effusions using evidence-based methods

Secondary Objectives:

- To enhance communication within the medical community about parapneumonic effusions by standardizing categorization of this problem
- To encourage clinical research in this field by defining areas of uncertainty
- To improve the quality of clinical research on parapneumonic effusions by pointing out the lack of rigorous controlled trials in this field
- To improve outcome for patients with parapneumonic effusions by providing a rigorous assessment of the clinical research supporting the various available management options

TARGET POPULATION

Patients with parapneumonic effusions at moderate or high risk for poor outcome.

These guidelines are <u>not</u> intended for use in patients with the following types of pleural effusions:

- Pleural effusions complicating trauma
- Postoperative pleural effusions
- Preexisting pleural effusions
- Chylous pleural effusions

INTERVENTIONS AND PRACTICES CONSIDERED

Treatment/ Management

1. No drainage
2. Therapeutic thoracentesis
3. Tube thoracostomy
4. Fibrinolytics requiring tube thoracostomy for administration of drug
5. Video-assisted thoracoscopic surgery with postprocedure tube thoracostomy
6. Surgery, including thoracotomy with or without decortication and rib resection. Surgery may have included concomitant lung resection and always included postoperative tube thoracostomy
7. Treatment of underlying pneumonia, including systemic antibiotics

MAJOR OUTCOMES CONSIDERED

Risk for poor outcome, including:

- Prolonged hospitalization
- Prolonged evidence of systemic toxicity
- Increased morbidity from any drainage procedure

- Increased risk for residual ventilatory impairment
- Increased risk for local spread of the inflammatory reaction
- Increased mortality

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

A literature review was performed for all medical and surgical treatments of parapneumonic effusion identified by panel members as clinically appropriate. MEDLINE was searched from 1966 through April 1, 1998, using the key terms pleural effusion, parapneumonic effusion, and empyema, each linked to thoracoscopy, thoracentesis, thoracostomy, chest tube, fibrinolytic agents, thrombolytic therapy, streptokinase, urokinase, x-ray computed tomography, ultrasonography, drainage, rib resection, and thoracotomy. Articles were restricted to English language and human studies. The reference lists of MEDLINE-retrieved articles were reviewed for titles of other, possibly relevant, articles. In addition, each panel member identified relevant articles in their own personal files for possible eligibility.

Criteria for including an article in the full panel review were as follows:

1. Adequate data were provided for $\geq$20 adult patients with parapneumonic effusion to allow evaluation of at least one relevant outcome (death or need for a second intervention to manage the parapneumonic effusion).
2. Reasonable assurance was provided that drainage was clinically appropriate (patients receiving drainage were in either categories 3 or 4 based on the risk approach developed by the panel) and drainage procedure was adequately described.
3. Original data were presented (i.e., data from patients reported multiple times in the literature by the same authors were only recorded once, and reviews were not acceptable).

NUMBER OF SOURCE DOCUMENTS

The literature review revealed 24 articles eligible for full review by the panel, 19 of which dealt with the primary management approach to parapneumonic effusions and 5 with a rescue approach after a previous approach had failed.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Level A: Randomized, controlled trials with consistent results or individual randomized, controlled trial with narrow confidence interval

Level B: Controlled cohort and case control series

Level C: Historically controlled series and case series

Level D: Expert opinion without explicit critical appraisal or based on physiology, bench research, or "first principles"

METHODS USED TO ANALYZE THE EVIDENCE

Meta-Analysis of Randomized Controlled Trials
Meta-Analysis of Summarized Patient Data
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Evaluation of Parapneumonic Effusions (PPEs):

To evaluate parapneumonic effusions (PPEs), the panel recommends categorizing patients with PPEs by their risk for a poor outcome. Establishing a method of risk categorization was critical because management options would be based on the estimated risk for poor outcome.

Based on consensus of clinical opinion, the expert panel developed an annotated table for evaluating the risk for poor outcome in patients with PPEs based on three variables, pleural space anatomy, pleural fluid bacteriology, and pleural fluid chemistry. This annotated table groups patients into four separate categories of risk for poor outcome. Insufficient data were available to reach consensus on how various patient characteristics, e.g., age, comorbid disease, and evidence of persistent inflammatory response despite appropriate antibiotic therapy, might affect these risk categories. The risk levels included: category 1 (very low risk), category 2 (low risk), category 3 (moderate risk), and category 4 (high risk).

Analysis of Management Options for PPEs:

Separate data abstraction forms for case series and historically controlled series and for randomized, controlled trials were developed, pilot tested, and refined. Information about study design (including quality assessments), study setting, patient characteristics, diagnostic testing, treatments, and outcomes were recorded on these abstraction forms. Abstraction forms were completed by at least two panel members for each journal article included for full review. After completion of the data abstraction forms by each individual reviewer, inconsistencies in data entry among reviewers were reconciled by the methodologists, and one final data abstraction form was submitted for each article. Data from the final forms were used to create the evidence tables.

The panel grouped parapneumonic effusion (PPE) management approaches into six categories: no drainage performed, therapeutic thoracentesis, tube thoracostomy, fibrinolytics, video-assisted thoracoscopic surgery, and surgery

(including thoracotomy with or without decortication and rib resection). The fibrinolytic approach required tube thoracostomy for administration of drug, and video-assisted thoracoscopic surgery included postprocedure tube thoracostomy. Surgery may have included concomitant lung resection and always included postoperative tube thoracostomy. All management approaches included appropriate treatment of the underlying pneumonia, including systemic antibiotics. The PPE management approaches were distinguished as either primary or rescue. Primary were those performed as the first approach to managing the PPE and rescue were those performed only after an earlier approach had failed.

Within each article, cohorts were defined, first, by whether drainage was clinically appropriate according to the panel's risk estimation method (category 3 and 4) and, second, by the PPE management approach. Data on two relevant outcomes, death and the need for a second intervention to manage the PPE, were used in this analysis. In most of the studies reviewed a causal relationship between the PPE and death could not be determined; consequently, only total deaths, not attributable deaths, were considered. The denominator used to calculate the proportion of patients requiring a second intervention to manage the PPE was not corrected for deaths, because most clinical circumstances should allow a second intervention to manage the parapneumonic effusion before death. The proportion and 95% confidence interval of patients either dying or requiring a second intervention to manage the PPE were calculated by management approach for each cohort within a study. The proportion and 95% confidence interval of patients suffering each of the two relevant outcomes were then calculated for the pooled data of individual cohorts for each management approach. Formal tests for heterogeneity of the data pooled across all studies within each management approach were not performed because review of the proportions showed wide variability. Data from studies reporting primary and rescue management approaches to PPE are presented separately.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The Health and Sciences Policy Committee of the American College of Chest Physicians selected a panel composed of a chair (chosen as a facilitator and organizer), expert representatives from relevant liaison organizations, and consultant methodologists. In addition to numerous teleconferences among small groups, the full panel met on two separate occasions.

Consensus on recommendations was reached after review of the evidence tables by all panel members. The strength of evidence supporting each drainage approach was graded according to a rating scheme (see "Rating Scheme for the Strength of the Evidence.")

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The following recommendations are graded based on level of evidence. The grading scheme is defined at the end of the recommendations.

Table 1: Categorizing Risk for Poor Outcome in Patients With Parapneumonic Effusion (PPE)

Pleural Space Anatomy		Pleural Fluid Bacteriology		Pleural Fluid Chemistry*	Category	Risk of Poor Outcome	Drainage
A_0 minimal, free-flowing effusion (<10 mm on lateral decubitus)**	AND	B_X culture and Gram stain results unknown	AND	C_X pH unknown	1	Very low	No***
A_1 small to moderate free-flowing effusion (> 10 mm and < 1/2 hemithorax)	AND	B_0 negative culture and Gram stain$	AND	C_0 pH $\geq$ 7.20	2	Low	No###
A_2 large, free-flowing effusion ($\geq$1/2 hemithorax)## loculated effusion,# or effusion with	OR	B_1 positive culture or Gram stain	OR	C_1 pH < 7.20	3	Moderate	Yes

thickened parietal pleura[$$]				
	B_2 pus	4	High	Yes

[*]pH is the preferred pleural fluid chemistry test, and pH must be determined using a blood gas analyzer. If a blood gas analyzer is not available, pleural fluid glucose should be used (P_0 glucose $\geq$60 mg/dL; P_1 glucose < 60 mg/dL). The panel cautions that the clinical utility and decision thresholds for pH and glucose have not been well-established.

[**]Clinical experience indicates that effusions of this size do not require thoracentesis for evaluation, but will resolve.

[***]If thoracentesis were performed in a patient with A_0 category pleural anatomy and P_1 or B_1 status found, clinical experience suggests that the P_1 or B_1 findings might be a false-positive. Repeat thoracentesis should be considered if effusion enlarges and/or clinical condition deteriorates.

[$]Regardless of prior use of antibiotics.

[###]If clinical condition deteriorates, repeat thoracentesis and drainage should be considered.

[##]Larger effusions are more resistant to effective drainage, possibly because of the increased likelihood that large effusions will also be loculated.

[#]Pleural loculations suggest a worse prognosis.

[$$]Thickened parietal pleura on contrast-enhanced computed tomography suggests presence of empyema.

Summary of Recommendations

1. In all patients with acute bacterial pneumonia, the presence of a parapneumonic effusion should be considered. Recommendation based on level C evidence.
2. In patients with parapneumonic effusion, the estimated risk for poor outcome, using the panel recommended approach based on pleural space anatomy, pleural fluid bacteriology, and pleural fluid chemistry, should be the basis for determining whether the parapneumonic effusion should be drained. Recommendation based on level D evidence.
3. Patients with category 1 or category 2 risk for poor outcome with parapneumonic effusion may not require drainage. Recommendation based on level D evidence.
4. Drainage is recommended for management of category 3 or 4 parapneumonic effusion based on pooled data for mortality and the need for second interventions with the no drainage approach. Recommendation based on level C evidence.

5. Based on the pooled data for mortality and the need for second interventions, therapeutic thoracentesis or tube thoracostomy alone appear to be insufficient treatment for managing most patients with category 3 or 4 parapneumonic effusion. Recommendation based on level C evidence. However, the panel recognizes that in the individual patient, therapeutic thoracentesis or tube thoracostomy, as planned interim steps before a subsequent drainage procedure, may result in complete resolution of the parapneumonic effusion. Careful evaluation of the patient for several hours is essential in these cases. If resolution occurs, no further intervention is necessary. Recommendation based on level D evidence.
6. Fibrinolytics, video assisted thoracoscopic surgery, and surgery are acceptable approaches for managing patients with category 3 and category 4 parapneumonic effusion based on cumulative data across all studies that indicate that these interventions are associated with the lowest mortality and need for second interventions. Recommendation based on level C evidence.

Definitions

Grading of evidence scheme:

Level A: Randomized, controlled trials with consistent results or individual randomized, controlled trial with narrow confidence interval

Level B: Controlled cohort and case control series

Level C: Historically controlled series and case series

Level D: Expert opinion without explicit critical appraisal or based on physiology, bench research, or "first principles."

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified for each recommendation (refer to "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate medical and surgical treatment of parapneumonic effusions may decrease the need for second intervention as well as the total mortality rate among patients treated for parapneumonic effusions.

POTENTIAL HARMS

The proportion and 95% confidence interval of patients suffering each of the two relevant outcomes (death and need for a second intervention to manage the parapneumonic effusion) were calculated for the pooled data for each management approach from the 19 articles on the primary management approach.

The pooled proportion of deaths was higher for the no drainage (6.6%), therapeutic thoracentesis (10.3%), and tube thoracostomy management approaches (8.8%) than for the fibrinolytic (4.3%), video-assisted thoracoscopic surgery (4.8%), and surgery (1.9%) approaches, but the 95% confidence interval showed considerable overlap among all six possible primary management approaches.

The pooled proportion of patients needing a second intervention to manage the parapneumonic effusion was higher for the no drainage (49.2%), therapeutic thoracentesis (46.3%), and tube thoracostomy (40.3%) management approaches than the fibrinolytic (14.9%), video-assisted thoracoscopic surgery (0%), and surgery (10.7%) approaches; there was no overlap in the 95% confidence interval between the first three and the last three management approaches, indicating a nonrandom difference.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

The studies identified through a careful literature review as relevant to the medical and surgical management of parapneumonic effusion have significant methodological limitations. Despite these limitations in the data, there did appear to be consistent and possibly clinically meaningful trends for the pooled data and the results of the randomized, controlled trails and the historically controlled series on the primary management approach to parapneumonic effusion. Based on these trends and consensus opinion the panel made recommendations for the management of parapneumonic effusion.

The panel urges that these recommendations be viewed cautiously because of the methodological problems. Especially important would be to avoid making definitive recommendations on the preferability of individual primary management approaches because of the limited available comparison data.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Colice GL, Curtis A, Deslauriers J, Heffner J, Light R, Littenberg B, Sahn S, Weinstein RA, Yusen RD. Medical and surgical treatment of parapneumonic effusions: an evidence-based guideline. Chest 2000 Oct;118(4):1158-71. [41 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2000 Oct

GUIDELINE DEVELOPER(S)

American College of Chest Physicians - Medical Specialty Society

SOURCE(S) OF FUNDING

American College of Chest Physicians

GUIDELINE COMMITTEE

American College of Chest Physicians Parapneumonic Effusions Panel

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: Gene L. Colice, MD, FCCP; Anne Curtis, MD; Jean Deslauriers, MD; John Heffner, MD, FCCP; Richard Light, MD, FCCP; Benjamin Littenberg, MD; Steven Sahn, MD, FCCP; Robert A. Weinstein, MD; and Roger D. Yusen, MD, for the American College of Chest Physicians Parapneumonic Effusions Panel.

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

An update is not in progress at this time.

GUIDELINE AVAILABILITY

Electronic copies: Available from the American College of Chest Physicians Web site:

- HTML Format
- PDF Format

Print copies: Available from the American College of Chest Physicians, Products and Registration Division, 3300 Dundee Road, Northbrook IL 60062-2348.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on August 26, 2001. The information was verified by the guideline developer on September 14, 2001.

COPYRIGHT STATEMENT

This NGC summary is based on the original guideline, which may be subject to the guideline developer's copyright restrictions.

© 1998-2004 National Guideline Clearinghouse

Date Modified: 4/12/2004