



Complete Summary

GUIDELINE TITLE

Practice management guideline for pulmonary contusion - flail chest.

BIBLIOGRAPHIC SOURCE(S)

Simon B, Ebert J, Bokhari F, Capella J, Emhoff T, Hayward T III, Rodriguez A, Smith L. Practice management guideline for "pulmonary contusion - flail chest". Charleston (SC): Eastern Association for the Surgery of Trauma (EAST); 2006 Jun. 74 p. [100 references]

GUIDELINE STATUS

This is the current release of the guideline.

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SCOPE

DISEASE/CONDITION(S)

Pulmonary contusion/flail chest (PC/FC)

GUIDELINE CATEGORY

Management
Treatment

CLINICAL SPECIALTY

Critical Care
Emergency Medicine
Pulmonary Medicine
Thoracic Surgery

INTENDED USERS

Advanced Practice Nurses
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To provide recommendations for the practice management of pulmonary contusion/flail chest (PC/FC) in traumatic injury patients
- To identify the extent and quality of scientific support for management decisions in regard to the following questions:
 1. What are the appropriate principles for fluid management for patients with pulmonary contusions?
 2. Ventilatory support
 - When is mechanical ventilation indicated for PC/FC?
 - Is there a role for non-invasive ventilation?
 - What is the optimal mode of ventilation for severe pulmonary contusion and/or flail chest?
 3. Is there a role for surgical fixation of flail chest injuries?

TARGET POPULATION

Trauma patients with pulmonary contusion/flail chest (PC/FC)

INTERVENTIONS AND PRACTICES CONSIDERED

Management

1. Fluid management
 - Resuscitation with isotonic crystalloid or colloid solution
 - Pulmonary artery catheterization to avoid fluid overload
 - Diuretics in the setting of hydrostatic fluid overload
2. Ventilatory support
 - Mechanical ventilation
 - Analgesia and chest physiotherapy in conjunction with mechanical ventilation
 - Positive end-expiratory pressure/continuous positive airway pressures (PEEP/CPAP)
 - Independent lung ventilation (ILV)

Note: Steroids were considered but not recommended in the therapy of pulmonary contusion

Treatment

Surgical fixation of flail chest injury or in patients requiring mechanical ventilation when thoracotomy is otherwise required

MAJOR OUTCOMES CONSIDERED

- Rates of morbidity, mortality, and survival
- Length of ventilation and length of hospital stay
- Complications of treatment
- Other measures, such as size of pulmonary contusion (PC), fluid balance, lung volume, oxygenation levels, stabilization of mobile chest, pain, dyspnea, deformity, incidence of pneumonia

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

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

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

A computerized search was conducted of the Medline, Embase, Pubmed and Cochrane controlled trials databases for North American and European English language literature for the period from 1966 through June 30, 2005. The initial search terms were "pulmonary contusion," "flail chest," "rib fractures," chest injuries," and "thoracic injuries". This search initially yielded 91 articles. An additional 45 works were obtained from the references of these studies yielding a total of 136 papers. Thirty-eight of these articles were excluded as being case studies, reviews, letters, or otherwise irrelevant to the questions being asked. The remaining 98 studies were reviewed, graded and listed in the evidentiary table.

NUMBER OF SOURCE DOCUMENTS

98 studies are contained in the evidentiary table

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

Class I

Prospective randomized controlled trials

Class II

Clinical studies in which data was collected prospectively and retrospective analyses that were based on clearly reliable data. Types of studies so classified include observational studies, cohort studies, prevalence studies and case control studies.

Class III

Studies based on retrospectively collected data. Evidence used in this class includes clinical series and database or registry review.

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

The practice parameter workgroup for pulmonary contusion/flail chest (PC/FC) consisted of eight trauma surgeons, three of whom were also trained and certified as thoracic surgeons. All studies were reviewed by two committee members and graded according to the standards recommended by the Eastern Association for the Surgery of Trauma (EAST) Ad Hoc Committee for Guideline Development. Grade I evidence was also sub-graded for quality of design utilizing the Jahad Validity Scale published in *Controlled Clinical Trials* in 1996. Any studies with conflicting grading were reviewed by the committee chairperson as were all Grade I studies.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Level 1

The recommendation is convincingly justifiable based on the available scientific information alone. This recommendation is usually based on Class I data, however, strong Class II evidence may form the basis for a Level I recommendation, especially if the issue does not lend itself to testing in a randomized format. Conversely, low quality or contradictory Class I data may not be able to support a Level I recommendation.

Level 2

The recommendation is reasonably justifiable by available scientific evidence and strongly supported by expert opinion. This recommendation is usually supported by Class II data or a preponderance of Class III evidence.

Level 3

The recommendation is supported by available data but adequate scientific evidence is lacking. This recommendation is generally supported by Class III data. This type of recommendation is useful for educational purposes and in guiding future clinical research.

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

The draft document is submitted to all members of the panel for review and modification. Subsequent to this the guidelines are forwarded to the chairman of the Eastern Association for the Surgery of Trauma (EAST) ad hoc committee for guideline development. Final modifications are made and the document forwarded back to the individual panel chairpersons.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The levels of recommendation (1-3) and classes of evidence (I-III) are defined at the end of the "Major Recommendations" field.

Level 1

1. There is no support for Level I recommendations regarding pulmonary contusion/flail chest (PC-FC).

Level 2

1. Trauma patients with PC-FC should not be excessively fluid restricted, but rather should be resuscitated as necessary with isotonic crystalloid or colloid solution to maintain signs of adequate tissue perfusion. Once adequately resuscitated, unnecessary fluid administration should be meticulously avoided. A pulmonary artery catheter *may* be useful to avoid fluid overload.
2. Obligatory mechanical ventilation should be avoided.
3. The use of optimal analgesia and aggressive chest physiotherapy should be applied to minimize the likelihood of respiratory failure and ensuing ventilatory support. Epidural catheter is the preferred mode of analgesia delivery in severe flail chest injury. (see EAST Practice Management Guideline (PMG) "Pain Management in Blunt Thoracic Trauma")
4. Patients with PC-FC requiring mechanical ventilation should be supported in a manner based on institutional and physician preference and separated from the ventilator at the earliest possible time. Positive end-expiratory

pressure/continuous positive airway pressures (PEEP/CPAP) should be included in the ventilatory regimen.

5. Steroids should not be used in the therapy of pulmonary contusion.

Level 3

1. A trial of mask continuous positive airway pressure (CPAP) should be considered in alert, compliant patients with marginal respiratory status.
2. Independent lung ventilation may be considered in severe unilateral pulmonary contusion when shunt cannot be otherwise corrected due to maldistribution of ventilation or when crossover bleeding is problematic.
3. Diuretics may be used in the setting of hydrostatic fluid overload as evidenced by elevated pulmonary capillary wedge pressures in hemodynamically stable patients or in the setting of known concurrent congestive heart failure.
4. Surgical fixation may be considered in severe unilateral flail chest or in patients requiring mechanical ventilation when thoracotomy is otherwise required.

Definitions:

Rating Scheme for Strength of Recommendations

Level 1

The recommendation is convincingly justifiable based on the available scientific information alone. This recommendation is usually based on Class I data, however, strong Class II evidence may form the basis for a Level I recommendation, especially if the issue does not lend itself to testing in a randomized format. Conversely, low quality or contradictory Class I data may not be able to support a Level I recommendation.

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Rating Scheme for Strength of Evidence

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CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate management and treatment of patients with pulmonary contusion/flail chest (PC/FC)

POTENTIAL HARMS

Complications related to management/treatment measures

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

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ADAPTATION

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

DATE RELEASED

2006 Jun

GUIDELINE DEVELOPER(S)

Eastern Association for the Surgery of Trauma - Professional Association

SOURCE(S) OF FUNDING

Eastern Association for the Surgery of Trauma (EAST)

GUIDELINE COMMITTEE

EAST Practice Management Workgroup for Pulmonary Contusion- Flail Chest

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Workgroup Members: Bruce Simon, MD; James Ebert, MD; Faran Bokhari, MD; Jeanette Capella, MD; Timothy Emhoff, MD; Thomas Hayward III, MD; Aurelio Rodriguez, MD; Lou Smith, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [Eastern Association for the Surgery of Trauma \(EAST\) Web site](#).

Print copies: Available from the Eastern Association for the Surgery of Trauma Guidelines, c/o William J. Bromberg, MD, FACS, Memorial Health University Medical Center, Savannah Surgical Group, Inc., 4700 Waters Avenue, Savannah, GA 31404; Phone: (912) 350-7412; Email: guidelines@east.org

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on January 9, 2007. The information was verified by the guideline developer on February 26, 2007.

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