Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

Best evidence statement (BESt). Recruitment maneuvers for acute lung injury.

Bibliographic Source(s)

Cincinnati Children's Hospital Medical Center. Best evidence statement (BESt). Recruitment maneuvers for acute lung injury. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2011 Nov 22. 6 p. [20 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

The strength of the recommendation (strongly recommended, recommended, or no recommendation) and the quality of the evidence (1aâ€'5b) are defined at the end of the "Major Recommendations" field.

It is recommended that recruitment maneuvers (RM) be used with mechanically ventilated patients diagnosed with acute lung injury to improve acute lung injury and decrease atelectasis (Lapinsky & Mehta, 2005 [1b]; Badet et al., 2009 [2a]; Marchenkov et al., 2010 [2a]; Meade et al., 2008 [2a]; Scohy et al., 2009 [2a]; Tusman et al., 2003 [2a]; Iannuzzi et al., 2010 [2b]; Maa et al., 2005 [2b]; Boriosi et al., 2011 [3a]; Duff, Rosychuk, & Joffe, 2007 [3a]; Povoa et al., 2004 [3a]; Toth et al., 2007 [3a]; Hodgson et al., 2011 [4a]; Dernaika & McCaffree, 2007 [5a]; Kacmarek & Villar, 2011 [5a]; Papadakos, Lachmann, & Rudolph Koch, 2010 [5a]; Stiller, 2000 [5a]; Principi et al., 2011 [5b]).

Note: Potential risks for use of RM are transient hypotension, decreased venous return and barotrauma (Lapinsky & Mehta, 2005 [1b]; Marchenkov et al., 2010 [2a]; Iannuzzi et al., 2010 [2b]; Duff, Rosychuk, & Joffe, 2007 [3a]; Hodgson et al., 2011 [4a]; Dernaika & McCaffree, 2007 [5a]; Kacmarek & Villar, 2011 [5a]).

Definitions:

Table of Evidence Levels

Quality Level	Definition
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain

Quality Level	Definition
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5a or 5b	General review, expert opinion, case report, consensus report, or guideline
5	Local consensus

†a = good quality study; b = lesser quality study

Note: See the original guideline document for further information about the dimensions used to judge the strength of the evidence.

Table of Recommendation Strength

Strength	Definition
It is strongly recommended that… It is strongly recommended that… not…	There is consensus that benefits clearly outweigh risks and burdens (or vice versa for negative recommendations).
It is recommended that… It is recommended that… not…	There is consensus that benefits are closely balanced with risks and burdens.
There is insufficient evidence and a lack of consensus to make a recommendation…	
Dimensions: In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.	
1. Grade of the body of evidence 2. Safety/harm 3. Health benefit to the patients (direct benefit) 4. Burden to patient of adherence to recommendation (cost, hassle, discomfort, pain, motivation, ability to adhere, time) 5. Cost-effectiveness to healthcare system (balance of cost/savings of resources, staff time, and supplies based on published studies or onsite analysis) 6. Directness (the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome]) 7. Impact on morbidity/mortality or quality of life	

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Acute lung injury and/or atelectasis requiring mechanical ventilation

Guideline Category

Treatment

Clinical Specialty

Emergency Medicine

Pediatrics

Pulmonary Medicine

Intended Users

Advanced Practice Nurses

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

To evaluate, among newborn infants through adults with artificial airways that are mechanically ventilated, if recruitment maneuvers compared to conventional mechanical ventilation leads to improvement of acute lung injury and/or atelectasis

Target Population

Newborn infants through adults who are mechanically ventilated with acute lung injury and/or atelectasis

Note: Exclusion criteria include patients with increased intracranial pressure, pneumothorax and hemodynamic instability.

Interventions and Practices Considered

1. Mechanical ventilation
2. Recruitment maneuvers (by manual inflation bag or ventilator manipulation)
3. Timing and duration of recruitment maneuvers

Major Outcomes Considered

- Time to resolution of atelectasis
- Patient, family, and staff satisfaction
- Number of ventilator days
- Time in intensive care unit (ICU)
- Duration of traditional therapy
- Costs of therapy (traditional therapy, ventilator use, and ICU stay)

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Keywords: Recruitment maneuver, pediatric, acute lung injury, mechanically ventilated, open lung technique, atelectasis, intubated, artificial airway

Databases: Medline/PubMed, MD Consult, and Google Scholar

Filters: none

Date range searched: 2000-2011

Number of Source Documents

Not stated

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

Table of Evidence Levels

Quality Level	Definition
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5a or 5b	General review, expert opinion, case report, consensus report, or guideline
5	Local consensus

†a = good quality study; b = lesser quality study

Note: See the original guideline document for further information about the dimensions used to judge the strength of the evidence.

Methods Used to Analyze the Evidence

Systematic Review

Description of the Methods Used to Analyze the Evidence

Not stated

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

Table of Recommendation Strength

Strength	Definition
It is strongly recommended that… It is strongly recommended that… not…	There is consensus that benefits clearly outweigh risks and burdens (or vice versa for negative recommendations).
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There is insufficient evidence and a lack of consensus to make a recommendation…	
Dimensions: In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.	
1. Grade of the body of evidence 2. Safety/harm 3. Health benefit to the patients (direct benefit) 4. Burden to patient of adherence to recommendation (cost, hassle, discomfort, pain, motivation, ability to adhere, time) 5. Cost-effectiveness to healthcare system (balance of cost/savings of resources, staff time, and supplies based on published studies or onsite analysis) 6. Directness (the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome]) 7. Impact on morbidity/mortality or quality of life	

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

This Best Evidence Statement has been reviewed against quality criteria by 2 independent reviewers from the Cincinnati Children's Hospital Medical Center (CCHMC) Evidence Collaboration.

Evidence Supporting the Recommendations

References Supporting the Recommendations

Badet M, Bayle F, Richard JC, Guerin C. Comparison of optimal positive end-expiratory pressure and recruitment maneuvers during lung-protective mechanical ventilation in patients with acute lung injury/acute respiratory distress syndrome. Respir Care. 2009 Jul;54(7):847-54. PubMed

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Hodgson CL, Tuxen DV, Bailey MJ, Holland AE, Keating JL, Pilcher D, Thomson KR, Varma D. A positive response to a recruitment maneuver with PEEP titration in patients with ARDS, regardless of transient oxygen desaturation during the maneuver. J Intensive Care Med. 2011 Jan-Feb;26(1):41-9. PubMed

Iannuzzi M, De Sio A, De Robertis E, Piazza O, Servillo G, Tufano R. Different patterns of lung recruitment maneuvers in primary acute respiratory distress syndrome: effects on oxygenation and central hemodynamics. Minerva Anestesiol. 2010 Sep;76(9):692-8. PubMed

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Maa SH, Hung TJ, Hsu KH, Hsieh YI, Wang KY, Wang CH, Lin HC. Manual hyperinflation improves alveolar recruitment in difficult-to-wean patients. Chest. 2005 Oct;128(4):2714-21. PubMed

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Toth I, Leiner T, Mikor A, Szakmany T, Bogar L, Molnar Z. Hemodynamic and respiratory changes during lung recruitment and descending optimal positive end-expiratory pressure titration in patients with acute respiratory distress syndrome. Crit Care Med. 2007 Mar;35(3):787-93. PubMed

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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

Improvement of acute lung injury and/or atelectasis

Potential Harms

Not stated

Qualifying Statements

Qualifying Statements

This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Implementation of the Guideline

Description of Implementation Strategy

Applicability Issues

Potential applicability issues for implementation of recruitment maneuvers (RM) are development of a standardized procedure (including frequency and method) for each patient population, development of an order set and documentation and staff education.

Implementation Tools

Audit Criteria/Indicators

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

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Adaptation

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

Date Released

2011 Nov 22

Guideline Developer(s)

Cincinnati Children's Hospital Medical Center - Hospital/Medical Center

Source(s) of Funding

Cincinnati Children's Hospital Medical Center

Guideline Committee

Not stated

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

Conflicts of interest were declared for each team member and no financial conflicts of interest were found.

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the Cincinnati Children's Hospital Medical Center Web site .

Print copies: For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Cincinnati Children's Hospital Medical Center Health James M. Anderson Center for Health Systems Excellence at EBDMInfo@cchmc.org.

Availability of Companion Documents

The following are available:

- Judging the strength of a recommendation. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2008 Jan. 1 p. Available from the Cincinnati Children's Hospital Medical Center Web site .
- Grading a body of evidence to answer a clinical question. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 1 p. Available from the Cincinnati Children's Hospital Medical Center Web site .
- Table of evidence levels. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2008 Feb 29. 1 p. Available from the Cincinnati Children's Hospital Medical Center Web site .

Print copies: For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Cincinnati Children's Hospital Medical Center Health James M. Anderson Center for Health Systems Excellence at EBDMInfo@cchmc.org.

In addition, suggested process or outcome measures are available in the original guideline document .

Patient Resources

None available

NGC Status

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