Complete Summary

GUIDELINE TITLE

Evidence-based guidelines for weaning and discontinuation of ventilatory support.

BIBLIOGRAPHIC SOURCE(S)

Evidence-based guidelines for weaning and discontinuation of ventilatory support. Chest 2001 Dec;120(6 Suppl):375S-484S. [224 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)

Ventilator dependency

GUIDELINE CATEGORY

Evaluation
Management
Risk Assessment

CLINICAL SPECIALTY

Critical Care
Pulmonary Medicine

INTENDED USERS

Physicians
Respiratory Care Practitioners

GUIDELINE OBJECTIVE(S)

- To present evidence-based recommendations for the evaluation and management of the ventilator-dependent patient during the process of weaning and/or discontinuation from ventilator support
- To address specifically the following five issues concerning ventilator discontinuation:
    - the pathophysiology of ventilator dependence
    - the criteria for identifying patients who are capable of ventilator discontinuation
    - ventilator management strategies to maximize the discontinuation potential
    - the role of tracheotomy
    - the role of long-term facilities

TARGET POPULATION

Adult and pediatric patients receiving mechanical ventilation in intensive care units (ICUs), intermediate-care units, and postanesthesia recovery rooms

Note: These guidelines are not intended for use in home ventilation or chronic ventilation settings.

INTERVENTIONS AND PRACTICES CONSIDERED

1. Assessment of causes of ventilator dependence
2. Assessment of discontinuation potential
3. Spontaneous breathing trials (SBTs)
4. Discontinuation of ventilatory support
5. Management of patient who has failed a spontaneous breathing trial through use of various modes of partial ventilator support:
    - Synchronized intermittent mandatory ventilation (SIMV)
    - Pressure support ventilation (PSV)
    - Volume support (VS)
    - Volume assured pressure support (pressure augmentation) [VAPS (PA)]
    - Mandatory minute ventilation (MMV),
    - Airway pressure release ventilation (APRV)
6. Anesthesia and sedation strategies and ventilator management in the postsurgical patient
7. Non-physician driven protocols for mechanically ventilated patients
8. Tracheotomy in ventilator-dependent patients
9. Long-term care facilities
10. Weaning strategies in patients requiring prolonged mechanical ventilation

Note: Miscellaneous interventions (e.g., enteral nutrition, biofeedback, acupuncture) to wean from mechanical ventilation were considered; however, recommendations were not offered.

MAJOR OUTCOMES CONSIDERED

- Client readiness for ventilator discontinuance, as evidenced by multiple factors (oxygenation, cardiovascular and metabolic status, respiratory

acidosis, hemoglobin, mentation, disease status, cough reflex, and physician´s assessment of potential for successful extubation)
- Likelihood ratios (LRs) predicting ventilator discontinuation performance:
    - Measurement parameters during ventilatory support
    - Measurement parameters during a brief period of spontaneous breathing
- Frequency of patients tolerating a spontaneous breathing trial (SBT)
- Rate of permanent ventilator discontinuation following a successful SBT
- SBT tolerance as measured by physiologic parameters indicating gas exchange, as well as subjective clinical assessments (mental status, discomfort, diaphoresis, signs of increased work of breathing)
- Effects of non-physician driven protocols for mechanically ventilated patients on enhancing clinical outcomes and reducing costs for critically ill patients page
- Impact of tracheotomy on patient comfort, airway resistance, ventilator-associated pneumonia, duration of mechanical ventilation, intensive care unit (ICU) outcomes, and health care costs
- Clinical outcome and safety of transferring patients for weaning from prolonged mechanical ventilation (PMV)

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
Searches of Patient Registry Data

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

To identify relevant studies, the following databases were searched: MEDLINE, Excerpta Medica Database (EMBASE), Health Services Technology Administration and Research, Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Cochrane Controlled Trials Registry, and the Cochrane Data Base of Systematic Reviews from 1971 to 1998. Reference lists and personal files were examined, and the journal Respiratory Care was hand searched. Unpublished literature was not explicitly searched.

All articles that either of two reviewers of the titles and abstracts considered to be possibly eligible were retrieved. The same two reviewers examined the full text and made final decisions regarding eligibility based on the inclusion and exclusion criteria.

NUMBER OF SOURCE DOCUMENTS

154 studies

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

Grades of Evidence

A. Scientific evidence provided by well-designed, well-conducted, controlled trials (randomized and nonrandomized) with statistically significant results that consistently support the guideline recommendation
B. Scientific evidence provided by observational studies or by controlled trials with less consistent results to support the guideline recommendation
C. Expert opinion supported the guideline recommendation, but scientific evidence either provided inconsistent results or was lacking

METHODS USED TO ANALYZE THE EVIDENCE

Meta-Analysis of Observational Trials
Meta-Analysis of Randomized Controlled Trials
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

General forms to abstract data from all studies and forms that were specific to randomized trials, nonrandomized controlled studies, and studies of weaning predictors were developed. An implementation manual was developed and five respiratory therapists and five intensivists were trained to abstract data related to study characteristics, methodological quality, and results using duplicate independent reviews. Quantitative data were abstracted using several metrics. Results were pooled across randomized trials and across studies of weaning predictors only when the patients, interventions, and outcomes suggested that pooling was legitimate. Additional details specific to each clinical question are reported in brief in the systematic reviews accompanying this guideline (see "Companion Documents" field).

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Following the development of evidence-based reviews, a series of recommendations were developed by the task force. As there were many areas in which evidence was weak or absent, the expert opinion of the task force was relied on to "fill in the gaps." Consensus was reached, first, by team discussions and, later, through the repeated cycling of the draft through all members of the task force.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

Weaning/discontinuation protocols that are designed for nonphysician health-care professionals (HCPs)

There is clear evidence that nonphysician health-care professionals (HCPs) (e.g., respiratory therapists and nurses) can execute protocols that enhance clinical outcomes and reduce costs for critically ill patients. In recent years, three randomized controlled trials incorporating 1,042 patients also have demonstrated that outcomes for mechanically ventilated patients who were managed using HCPs-driven protocols were improved over those of control patients managed with standard care. Specifically, Ely et al. published the results of a two-step protocol driven by HCPs using a daily screening procedure followed by a spontaneous breathing trial (SBT) in those who met the screening criteria. The discontinuation of mechanical ventilation then was recommended for patients tolerating the spontaneous breathing trial. Although the 151 patients managed with the protocol had a higher severity of illness than the 149 control subjects, they were removed from the ventilator 1.5 days earlier (with 2 days less weaning), had 50% fewer complications related to the ventilator, and had mean intensive care unit (ICU) costs of care that were lower by > $5,000 per patient. In a slightly larger trial with a more diverse patient population, Kollef et al used three different HCP-driven protocols and showed that the mean duration of mechanical ventilation could be reduced by 30 hours. Finally, Marelich et al showed that the duration of mechanical ventilatory support could be reduced almost 50% using nurse-driven and therapist-driven protocols ($p = 0.0001$).

Tracheotomy

Patient series reported during the early 1980s suggested that tracheotomy had a high risk of perioperative and long-term airway complications, such as tracheal stenosis. More recent studies, however, have established that standard surgical tracheotomy can be performed with an acceptably low risk of perioperative complications. Regarding long-term risks, analyses of longitudinal studies suggest that the risk of tracheal stenosis after tracheotomy is not clearly higher than the risks of subglottic stenosis from prolonged translaryngeal intubation. Also, the nonrandomized studies commonly reported in the literature bias results toward greater long-term airway injury in patients undergoing tracheotomy because the procedure was performed after a prolonged period of translaryngeal intubation, which may prime the airway for damage from a subsequent tracheotomy. Finally, the cost of tracheotomy can be lowered if it is performed in the ICU rather than in an operating room, either by the standard surgical or percutaneous dilational technique. Even when tracheotomy is performed in an operating room, the cost may be balanced by cost savings if a ventilator-dependent patient can be moved from an ICU setting after the placement of a tracheostomy. The actual cost benefits of tracheotomy, however, have not been established because no rigorous cost-effectiveness analyses have been performed.

Long-term Care Facilities

Prior to the 1980s, ventilator-dependent patients simply remained in ICUs and were managed using acute-care principles. The only other option was permanent ventilatory support in either the patient's home or in a nursing home. Financial

pressures, coupled with the concept that the aggressive ICU mindset might not be optimal for the more slowly recovering patient, have led to the creation of weaning facilities (both free-standing facilities and units within hospitals) that are potentially more cost-effective and better suited to meet the needs of these patients. A body of literature now is emerging that suggests that many patients who previously would have been deemed "unweanable" may achieve ventilator independence in such facilities.

The facilities generating the data of Table 9 of the original guideline document are of two basic types. (1) Most facilities, but not all, are licensed as long-term acute-care hospitals, which are required by the Health Care Financing Administration to maintain a mean length of stay (LOS) of > 25 days. These facilities are most often free-standing hospitals, which may have their own ICUs. Called "regional weaning centers" (RWCs) in Table 9 of the original guideline document, they serve several to many hospitals in their geographic area. (2) Step-down units or noninvasive respiratory-care units (NRCUs) have no specific length of stay requirement. These units usually reside within a host hospital and primarily serve that hospital. While both settings have acute-care staffing, but not critical-care (ICU) staffing, they are often dissimilar in hospital admission and discharge criteria, treatment capability, and the availability of specialty/subspecialty consultation services and procedures offered on site, all of which may have a significant effect on the outcome of care. Both of these types of facilities are characterized by less intensive staffing and less costly monitoring equipment and, therefore, they generate less cost per patient than do ICUs.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The guideline was reviewed by the American College of Chest Physicians (ACCP) Health and Sciences Policy Committee and Board of Regents, the American Association for Respiratory Care (AARC) Board, and the American College of Critical Care Medicine (ACCCM) Board.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Excerpted by the National Guideline Clearinghouse (NGC):

The grading scheme for the strength of the evidence for each recommendation (A-C) is defined at the end of the Major Recommendations.

Recommendation 1. In patients requiring mechanical ventilation for > 24 hours, a search for all the causes that may be contributing to ventilator dependence should be undertaken. This is particularly true in the patient who has failed attempts at withdrawing the mechanical ventilator. Reversing all possible ventilatory and nonventilatory issues should be an integral part of the ventilator discontinuation process. (Grade B)

Recommendation 2. Patients receiving mechanical ventilation for respiratory failure should undergo a formal assessment of discontinuation potential if the following criteria are satisfied:

1. Evidence for some reversal of the underlying cause of respiratory failure
2. Adequate oxygenation (eg, PaO_2/FIO_2 > 150-200; requiring positive end-expiratory pressure [PEEP] $\leq$ 5-8 cm H_2O; $FIO_2 \leq$ 0.4-0.5) and pH (e.g., $\geq$ 7.25)
3. Hemodynamic stability as defined by the absence of active myocardial ischemia and the absence of clinically important hypotension (i.e., a condition requiring no vasopressor therapy or therapy with only low-dose vasopressors such as dopamine or dobutamine < 5 micrograms/kg/min)
4. The capability to initiate an inspiratory effort

The decision to use these criteria must be individualized. Some patients not satisfying all of the above the criteria (e.g., patients with chronic hypoxemia below the thresholds cited) may be ready for attempts at discontinuation of mechanical ventilation. (Grade B)

Recommendation 3. Formal discontinuation assessments for patients receiving mechanical ventilation for respiratory failure should be performed during spontaneous breathing rather than while the patient is still receiving substantial ventilatory support. An initial brief period of spontaneous breathing can be used to assess the capability of continuing onto a formal spontaneous breathing trial (SBT). The criteria with which to assess patient tolerance during SBTs are the respiratory pattern, adequacy of gas exchange, hemodynamic stability, and subjective comfort. The tolerance of SBTs lasting 30 to 120 min should prompt consideration for permanent ventilator discontinuation. (Grade A)

Recommendation 4. The removal of the artificial airway from a patient who has successfully been discontinued from ventilatory support should be based on assessments of airway patency and the ability of the patient to protect the airway. (Grade C)

Recommendation 5. Patients receiving mechanical ventilation for respiratory failure who fail an SBT should have the cause for the failed SBT determined. Once reversible causes for failure are corrected, and if the patient still meets the criteria listed in Table 3 of the original guideline document, subsequent SBTs should be performed every 24 h. (Grade A)

Recommendation 6. Patients receiving mechanical ventilation for respiratory failure who fail an SBT should receive a stable, nonfatiguing, comfortable form of ventilatory support. (Grade B)

Recommendation 7. Anesthesia/sedation strategies and ventilator management aimed at early extubation should be used in postsurgical patients. (Grade A)

Recommendation 8. Weaning/discontinuation protocols designed for nonphysician health care professionals (HCPs) should be developed and implemented by intensive care units (ICUs). Protocols aimed at optimizing sedation should also be developed and implemented. (Grade A)

Recommendation 9. Tracheotomy should be considered after an initial period of stabilization on the ventilator when it becomes apparent that the patient will require prolonged ventilator assistance. Tracheotomy should then be performed when the patient appears likely to gain one or more of the benefits ascribed to the procedure. Patients who may derive particular benefit from early tracheotomy are the following:

- Those requiring high levels of sedation to tolerate translaryngeal tubes
- Those with marginal respiratory mechanics (often manifested as tachypnea) in whom a tracheostomy tube having lower resistance might reduce the risk of muscle overload
- Those who may derive psychological benefit from the ability to eat orally, communicate by articulated speech, and experience enhanced mobility
- Those in whom enhanced mobility may assist physical therapy efforts

(Grade B)

Recommendation 10. Unless there is evidence for clearly irreversible disease (e.g., high spinal cord injury or advanced amyotrophic lateral sclerosis), a patient requiring prolonged mechanical ventilatory support for respiratory failure should not be considered permanently ventilator-dependent until 3 months of weaning attempts have failed. (Grade B)

Recommendation 11. Critical-care practitioners should familiarize themselves with facilities in their communities, or units in hospitals they staff, that specialize in managing patients who require prolonged dependence on mechanical ventilation. Such familiarization should include reviewing published peer-reviewed data from those units, if available. When medically stable for transfer, patients who have failed ventilator discontinuation attempts in the intensive care unit should be transferred to those facilities that have demonstrated success and safety in accomplishing ventilator discontinuation. (Grade C)

Recommendation 12. Weaning strategy in the prolonged mechanical ventilation (PMV) patient should be slow-paced and should include gradually lengthening self-breathing trials. (Grade C)

Definitions

Grades of Evidence

A. Scientific evidence provided by well-designed, well-conducted, controlled trials (randomized and nonrandomized) with statistically significant results that consistently support the guideline recommendation
B. Scientific evidence provided by observational studies or by controlled trials with less consistent results to support the guideline recommendation
C. Expert opinion supported the guideline recommendation, but scientific evidence either provided inconsistent results or was lacking

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").

In the original guideline document, each recommendation is followed by a review of the supporting evidence, including an assessment of the strength of evidence. As there were many areas in which evidence was weak or absent, the expert opinion of the task force was relied on to "fill the gaps."

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate evaluation and optimal medical management of the ventilator-dependent patient during the process of weaning and/or discontinuation from ventilator support, including:

- Easy and safe identification of which patients need prompt discontinuation and which need continued ventilatory support
- Development of ventilatory strategies for stable/recovering patients that minimize complications and resource consumption
- Development of appropriate extended management plans, including tracheostomy and long-term ventilator facilities, for long-term ventilator-dependent patients

Subgroups Most Likely to Benefit:

Patients who may derive particular benefit from early tracheotomy are the following:

- Those requiring high levels of sedation to tolerate translaryngeal tubes
- Those with marginal respiratory mechanics (often manifested as tachypnea) in whom a tracheostomy tube having lower resistance might reduce the risk of muscle overload
- Those who may derive psychological benefit from the ability to eat orally, communicate by articulated speech, and experience enhanced mobility
- Those in whom enhanced mobility may assist physical therapy efforts

POTENTIAL HARMS

Premature discontinuation

Premature discontinuation of mechanical ventilation may result in difficulty reestablishing artificial airways and compromising gas exchange.

Spontaneous breathing trial (SBT)

A potential concern about the SBT is safety. Unnecessary prolongation of a failing SBT conceivably could precipitate muscle fatigue, hemodynamic instability, discomfort, or worsened gas exchange. There is evidence that the detrimental effects of ventilatory muscle overload, if it is going to occur, often occur early in the SBT.

Tracheotomy

The problems associated with tracheotomy include perioperative complications related to the surgery, long-term airway injury, and the cost of the procedure.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

Predictors of Weaning and Extubation Success

The guideline developers found that most theoretically plausible predictors of weaning and extubation success have no predictive power. Those with some predictive power include the rapid shallow breathing index, which has been most intensively studied, as well as the ratio of mouth occlusion pressure measured 0.1 s after the onset of inspiratory effort at P0.1 impedance to maximal inspiratory pressure and the CROP (compliance, rate, oxygenation, and pressure) index. However, these are relatively weak predictors of weaning success. It was found that tests are rarely useful in increasing the probability of weaning success, although on occasion, they can lead to moderate reductions in the probability of success. The reason that weaning predictors were found to perform poorly is probably because physicians have already considered the results when they select patients for study.

The best way to predict discontinuation success is by daily spontaneous breathing trials (SBTs) with an integrated assessment of comfort, gas exchange, and hemodynamics.

Non-physician Driven Protocols

Each institution must customize the protocols to local practice. Refer to the original guideline document for a discussion of general concepts.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Weaning/discontinuation protocols that are designed for nonphysician health-care professionals (HCPs) should be developed and implemented by intensive care units (ICUs). Protocols aimed at optimizing sedation also should be developed and implemented.

The data support the use of daily spontaneous breathing trials (SBTs) to determine potential in all patients recovering from respiratory failure. Spontaneous breathing trials should be part of any weaning protocol.

The data do not support endorsing any one ventilator discontinuation protocol, and the choice of a specific protocol is best left to the individual institution. In designing these protocols, consideration should be given to the recommendations in the original guideline document as well as to the specific patient populations. For instance, medical patients with severe lung injury might benefit from one type of management, whereas surgical patients recovering from anesthesia might benefit from another strategy. In the context of emerging data about the benefits of noninvasive positive- pressure ventilation (NPPV) and the substantial roles of health care professionals HCPs in providing this treatment, there should be efforts made to develop HCP-driven protocols for this modality.

While each institution must customize the protocols to local practice, there are important general concepts that may ease the process of implementation and enhance success.

First, protocols should not be used to replace clinical judgment, but rather to complement it. Protocols are meant as guides and can serve as the general default management decision unless the managing clinician can justify a departure from the protocol. Any such departure should be carefully assessed and used to guide possible future modifications of the protocol.

Second, protocols should not be viewed as static constructs, but rather as dynamic tools that are in evolution, which can be modified to accommodate new data and/or clinical practice patterns.

Third, institutions must be prepared to commit the necessary resources to develop and implement protocols. For instance, the effective implementation of protocols requires adequate staffing, as it has been shown that if staffing is reduced below certain thresholds, clinical outcomes may be jeopardized. Indeed, in the specific context of the discontinuation of mechanical ventilation, reductions in nurse/patient ratios have been associated with a prolonged duration of mechanical ventilation.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness
Patient-centeredness
Safety

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Evidence-based guidelines for weaning and discontinuation of ventilatory support. Chest 2001 Dec;120(6 Suppl):375S-484S. [224 references]

ADAPTATION

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

DATE RELEASED

2001 Dec

GUIDELINE DEVELOPER(S)

American Association for Respiratory Care - Professional Association
American College of Chest Physicians - Medical Specialty Society
American College of Critical Care Medicine - Professional Association

SOURCE(S) OF FUNDING

American College of Chest Physicians
American Association for Respiratory Care
American College of Critical Care Medicine

GUIDELINE COMMITTEE

American College of Chest Physicians (ACCP)/American Association for Respiratory Care (AARC)/American College of Critical Care Medicine (ACCCM) Expert Panel on Weaning from Ventilatory Support

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Neil R. MacIntyre, MD, FCCP (Chairman)

Writing Committee: Deborah J. Cook, MD, FCCP; E. Wesley Ely, Jr., MD, MPH, FCCP; Scott K. Epstein, MD, FCCP; James B. Fink, MS, RRT; John E. Heffner, MD, FCCP; Dean Hess, PhD, RRT; Rolf D. Hubmayer, MD, FCCP; David J. Scheinhorn, MD, FCCP

Members: Suzanne Burns, RN, MSN, CCRN, RRN; David Chao, MD, FCCP; Andres Esteban, MD; Douglas R. Gracey, MD, FCCP; Jesse Hall, MD, FCCP; Edward F. Haponik, MD, FCCP; Marin H. Kollef, MD, FCCP; Jordi Mancebo, MD; Constantine Manthous, MD, FCCP; Arthur S. Slutsky, MD, FCCP; Meg Stearn-Hassenpflug, MS, RD; James K. Stoller, MD, FCCP

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 Association for Respiratory Care Web site and to subscribers of Chest - The Cardiopulmonary and Critical Care Journal.

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

Print copies: Also available from the American Association for Respiratory Care, CPG Desk, 11030 Ables Ln, Dallas, TX 75229-4593

AVAILABILITY OF COMPANION DOCUMENTS

The following systematic reviews are available:

- Meade M, Guyatt G, Griffith L, Booke Lr, Randal Jl, Cook DJ. Introduction to a Series of Systematic Reviews of Weaning From Mechanical Ventilation. Chest 120: 396S-399S.
- Meade M, Guyatt G, Cook D, Griffith L, Sinuff T, Kergl C, Mancebo J, Esteban A, Epstein S. Predicting Success in Weaning From Mechanical Ventilation. Chest 120: 400S-424S.
- Meade M, Guyatt G, Sinuff T, Griffith L, Hand L, Toprani G, Cook DJ. Trials Comparing Alternative Weaning Modes and Discontinuation Assessments. Chest 120: 425S-437S.
- Cook D, Meade M, Guyatt G, Butler R, Aldawood A, Epstein S. Trials of Miscellaneous Interventions to Wean From Mechanical Ventilation. Chest 120: 438S-444S.
- Meade MO, Guyatt G, Butler R, Elms B, Hand L, Ingram A, Griffith L. Trials Comparing Early vs Late Extubation Following Cardiovascular Surgery. Chest 120: 445S-453S.
- Ely EW, Meade MO, Haponik EF, Kollef MH, Cook DJ, Guyatt GH, Stoller JK. Mechanical Ventilator Weaning Protocols Driven by Nonphysician Health-Care Professionals: Evidence-Based Clinical Practice Guidelines. Chest 120: 454S-463S.
- Meade MO, Guyatt GH, Cook DJ, Sinuff T, Butler R. Trials of Corticosteroids to Prevent Postextubation Airway Complications. Chest 120: 464S-468S.
- Cook DJ, Meade MO, Perry AG. Qualitative Studies on the Patient´s Experience of Weaning From Mechanical Ventilation. Chest 120: 469S-473S.
- Hess D. Ventilator Modes Used in Weaning. Chest 120: 474S-476S.
- Heffner JE. The Role of Tracheotomy in Weaning. Chest 120: 477S-481S.

- Scheinhorn DJ, Chao DC, Stearn Hassenpflug M, Gracey DR. Post-ICU Weaning From Mechanical Ventilation: The Role of Long-term Facilities. Chest 120: 482S-484S.

Electronic copies: Available in HTML and Portable Document Format (PDF) to subscribers of Chest - The Cardiopulmonary and Critical Care Journal.

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

The following is also available:

- Cook D, Meade M, Guyatt G, et al. Criteria for weaning from mechanical ventilation. Rockville (MD); Agency for Healthcare Research and Quality; 2000 June. (Systematic evidence review; no. 23). AHRQ publication no. AHRQ00-E028.

Electronic copies: Available from the Agency for Healthcare Research and Quality Web site.

Print copies: Available from the Agency for Healthcare Research and Quality Publications Clearinghouse. For more information, go to http://www.ahrq.gov/news/pubsix.htm or call 1-800-358-9295 (U.S. only). (Outside the United States: 1-410-381-3150;Toll-free TDD service; hearing impaired only: 888-586-6340.)

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on October 4, 2002. It was verified by the guideline developer on October 21, 2002.

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: 11/8/2004