Complete Summary

GUIDELINE TITLE

Evidence-based assessment of diagnostic tests for ventilator-associated pneumonia.

BIBLIOGRAPHIC SOURCE(S)

Grossman RF, Fein A. Evidence-based assessment of diagnostic tests for ventilator-associated pneumonia. Executive summary. Chest 2000 Apr;117(4 Suppl 2):177S-181S. [135 references]

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SCOPE

DISEASE/CONDITION(S)

Ventilator-associated pneumonia

GUIDELINE CATEGORY

Diagnosis
Evaluation

CLINICAL SPECIALTY

Critical Care
Infectious Diseases
Internal Medicine
Pulmonary Medicine

INTENDED USERS

Advanced Practice Nurses
Nurses
Physicians
Respiratory Care Practitioners

GUIDELINE OBJECTIVE(S)

To present evidence-based recommendations for the use of diagnostic tests for ventilator-associated pneumonia.

TARGET POPULATION

Mechanically ventilated, immunocompetent adults in hospital or long-term care settings.

These guidelines are not intended for pneumonia in patients not receiving ventilatory support (even those in critical care settings). In addition, these guidelines are not intended for use in the following mechanically ventilated patients:

- Children
- Adolescents
- Immunocompromised patients, including patients with AIDS

INTERVENTIONS AND PRACTICES CONSIDERED

Evaluation of Assessment Strategies and Diagnostic Tests

1. Assessment of clinical features
2. Chest radiographs
3. Culture or gram stain
4. Quantitative endotracheal aspiration
5. Blinded bronchial sampling
6. Mini-bronchoalveolar lavage
7. Blinded sampling with protected-specimen brush
8. Bronchoalveolar lavage
9. Protected-specimen brush
10. Protected bronchoalveolar lavage
11. Qualitative culture
12. Assessment for presence of antibody coating and elastin fibers

MAJOR OUTCOMES CONSIDERED

1. Validity and reliability of diagnostic tests, including:
    - Sensitivities
    - Specificities
    - Positive and negative predictive values
    - Likelihood ratios
2. Potential for adverse effects of diagnostic tests
3. Ability to improve patient outcomes

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

The MEDLINE database was searched for articles published from 1966 through 1995 by exploding the term "pneumonia" and the MESH terms "cross infection/artificial respiration" or the text words "ventilator associated pneumonia." Citations in this set were cross-referenced with articles retrieved by exploding the text word "diagnosis," MESH terms "sensitivity and specificity," and text words "BAL," "bronchoscopy," "protected brush catheters," "predictive value," and "likelihood ratio." Results of the computerized search were supplemented by examining personal files, other studies known to panel members, and reference lists of all primary studies and review articles retrieved in locating relevant studies.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus (Committee)
Subjective Review

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Grading systems for judging the quality of evidence typically identify randomized, controlled trials as the "gold standard," followed by controlled observational studies, descriptive epidemiology studies, and case reports. This paradigm is not useful in evaluating studies of test accuracy, because randomized, controlled trials are not necessarily the best setting for evaluating diagnostic test performance. Therefore, this report relies on narrative descriptions of study quality, rather than on rating schemes.

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Pairs of panelists reviewed and summarized the evidence for specific topic areas. The Panel Chair edited the final draft. Examination of the evidence involved the steps discussed below.

The quality of individual studies was judged using specific criteria for evaluating internal and external validity. Criteria for judging internal validity included the following: sample size, selection bias, definition of interventions and outcomes, and confounding variables. Criteria for judging external validity related to how well the results could be generalized to patients and conditions outside the study settings. Several central principles in evaluating diagnostic test performance were especially important in judging study quality.

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The evidence was summarized in narrative text and evidence tables. In addition to presenting the results of the studies, the tables compare the study designs according to the panel´s criteria for judging quality. Data on the sensitivity and specificity of tests were not pooled through meta-analysis to obtain an overall estimate of test performance. The significant variability in research methods, study populations, and definitions across studies made such a synthesis invalid.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The Health and Science Policy Committee of the American College of Chest Physicians assembled a panel of scientific experts to develop diagnostic recommendations based on a rigorous review of the literature. The panel included experienced methodologists to ensure that the review process was justifiable and unbiased. Recommendations were developed through group discussion and were based on direct evidence, when it was available, and expert consensus opinion, when direct evidence was not available.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Grade A: Recommendation based on direct scientific evidence.

Grade B: Recommendation based on scientific evidence, supplemented by expert opinion.

Grade C: Recommendation based on expert opinion alone.

Grade D: There is no definitive evidence or consensus opinion.

COST ANALYSIS

Costs Associated with Ventilator-Associated Pneumonia (VAP)

Several investigators have reported that nosocomial pneumonia increased the duration of hospitalization twofold to threefold compared to patients without pneumonia. Fagon and coworkers found the mean length of stay was 34 days for patients with VAP and 21 days for matched ventilator-assisted patients without VAP. Although more specific data are needed, hospital costs are dramatically increased in survivors of nosocomial pneumonia.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The recommendations were reviewed by the Health and Science Policy Committee of the American College of Chest Physicians and were referred for peer review by content experts.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

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

An associated pneumonia should be suspected in patients receiving mechanically ventilated if two or more of the following clinical features are present: temperature of greater than 38 degrees Celsius or lower than 36 degrees Celsius; leukopenia or leukocytosis; purulent tracheal secretions; and decreased PaO_2 (partial pressure alveolar oxygen). In the absence of such findings, no further investigations are required, and observation will suffice (grade B recommendation).

If two or more of these abnormalities are present, however, a chest radiograph should be evaluated. If the findings are normal, other causes of the abnormal clinical features should be investigated (grade C recommendation). If the radiograph shows alveolar infiltrates or an air bronchogram sign, or if the findings have worsened, the panel recommends one of two management options. The first options involves quantitative testing; and the second involves empirical treatment and nonquantitative (qualitative testing).

In the first option, quantitative procedures include nonbronchoscopic techniques (quantitative endotracheal aspiration, blinded bronchial sampling, mini-bronchoalveolar lavage, or blinded sampling with protected-specimen brush) and bronchoscopic techniques (bronchoalveolar lavage, protected-specimen brush, or protected bronchoalveolar lavage). Because these tests have similar sensitivities, specificities, positive predictive values, and likelihood ratios, the choice depends on local expertise, experience, availability, and cost factors (grade D recommendation).

Treatment should be based on the results of diagnostic testing. Decisions about empirical therapy should be determined by the patient's clinical stability, the degree of clinical suspicion, and the results of preliminary tests.

In the second option, the selection of appropriate empirical therapy is based on risk factors, local epidemiology, and resistance patterns, and involves qualitative testing to identify possible pathogens. Some clinicians include quantitative testing. Therapy is adjusted according to culture results or clinical response.

These two options are offered (grade D recommendation) because of insufficient high-level evidence to indicate that quantitative testing produces better clinical outcomes than empirical treatment. While invasive tests may avoid the use of antibiotics for clinically insignificant organisms, no direct evidence or consensus indicates the superiority of one invasive test over another (grade B recommendation). In a recent study, the withholding of antibiotic therapy when invasive tests did not confirm a clinical suspicion of ventilator-associated pneumonia was not associated with the recurrence of ventilator-associated pneumonia or with increased mortality rates. Factors to consider in choosing a test include sensitivity and specificity, ability to improve patient outcome, potential adverse effects, availability of the test, and cost. The panel did not determine whether the potential benefits of diagnostic testing outweigh the potential risks.

Recommendations were graded as follows:

Grade A: Recommendation based on direct scientific evidence;

Grade B: Recommendation based on scientific evidence, supplemented by expert opinion;

Grade C: Recommendation based on expert opinion alone; and

Grade D: There is no definitive evidence or consensus opinion.

CLINICAL ALGORITHM(S)

A diagnostic algorithm is provided for ventilator-associated pneumonia.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Recommendations were based on consideration of the evidence and, when direct evidence was lacking, recommendations were based on expert opinion.

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

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate clinical assessment and selection of diagnostic tests for patients suspected of ventilator-associated pneumonia may improve diagnostic accuracy, reduce the risk of potential adverse effects, and improve clinical outcomes.

POTENTIAL HARMS

- The major risk of bronchoalveolar lavage is the reduction of arterial oxygenation, as oxygenation may not be fully reestablished for several hours after injury.
- Inaccurate diagnosis may lead to overtreatment of patients without ventilator-associated pneumonia and lack of treatment of those with ventilator-associated pneumonia. This is most likely to occur when diagnosis is based on clinical features, radiographs or single bronchial-brush technique.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

1. Substantial gaps exist in the scientific knowledge of all of the techniques discussed in this guideline. The best example is the lack of data on the specificity and reproducibility of findings from chest radiographs. Because many diagnostic techniques have not been standardized, reported data on sensitivity and specificity vary, and it is difficult to compare results between medical centers. Another problem is that the populations that have been studied have been very heterogeneous, and some studies have used only subsets of patients in order to make a specific point.
2. Because of concerns about diagnostic accuracy, reproducibility of results, diagnostic thresholds, nonstandardized methodology, and lack of data on clinical outcomes, few definitive recommendations were reached.

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)

Grossman RF, Fein A. Evidence-based assessment of diagnostic tests for ventilator-associated pneumonia. Executive summary. Chest 2000 Apr;117(4 Suppl 2):177S-181S. [135 references]

ADAPTATION

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

DATE RELEASED

2000 Apr

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 Clinical Practice Guideline Panel

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: Ronald Grossman, MD, FCCP, Chair; Robert Baughman, MD, FCCP; G. Douglas Campbell, MD, FCCP; Deborah J. Cook, MD, FCCP; Don Craven, MD, FCCP; Alan Fein, MD, FCCP; Lionel Mandell, MD, FRCPC; Michael S. Niedermna, MD, FCCP; Antonio Torres, MD, FCCP; Steven Woolf, MD, MPH; Richard Wunderink, 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 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

The following is available:

- Evidence-based assessment of diagnostic tests for ventilator-associated pneumonia (2000): summary recommendations. Northbrook, IL: ACCP, 2001. (Quick reference guide for clinicians).

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

Print copies: Available from the American College of Chest Physicians, Products and Registration Division, 3300 Dundee Road, Northbrook IL 60062-2348, or by calling 1 (800) 343-2227.

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.

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