



Complete Summary

GUIDELINE TITLE

Clinical policy: critical issues in the management of adult patients presenting to the emergency department with acute carbon monoxide poisoning.

BIBLIOGRAPHIC SOURCE(S)

Wolf SJ, Lavonas EJ, Sloan EP, Jagoda AS, American College of Emergency Physicians. Clinical policy: critical issues in the management of adult patients presenting to the emergency department with acute carbon monoxide poisoning. *Ann Emerg Med* 2008 Feb;51(2):138-52. [71 references] [PubMed](#)

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

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SCOPE

DISEASE/CONDITION(S)

Acute carbon monoxide (CO) poisoning

GUIDELINE CATEGORY

Management

CLINICAL SPECIALTY

Emergency Medicine
Internal Medicine

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

- To evaluate the literature and make recommendations about the management of carbon monoxide (CO) poisoning
- To address the following critical questions:
 1. Should hyperbaric oxygen (HBO₂) therapy be used for the treatment of patients with acute CO poisoning
 2. Can clinical or laboratory criteria identify CO-poisoned patients who are most or least likely to benefit from this therapy?

TARGET POPULATION

Adult patients presenting to the emergency department with acute carbon monoxide (CO) poisoning

Note: This clinical policy is not intended for application to a pediatric population, for fetal exposures, for patients with chronic CO poisoning, or patients with delayed presentations (greater than 24 hours after cessation of exposure) of CO poisoning.

INTERVENTIONS AND PRACTICES CONSIDERED

Use of hyperbaric oxygen (HBO₂) therapy

MAJOR OUTCOMES CONSIDERED

Treatment Outcomes

- Neurologic sequelae
- Group mean neuropsychological tests scores
- Symptoms of carbon monoxide (CO) poisoning
- Cognitive sequelae
- Physical and emotional health
- Interference with activities of daily living
- Survival to hospital discharge

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

MEDLINE searches for articles published between January 1980 and January 2006 were performed using a combination of key words and their variations, including

"carbon monoxide poisoning," and "hyperbaric oxygen." Searches were limited to English-language sources. Additional articles were reviewed from the bibliography of articles cited and from published textbooks and review articles. Subcommittee members also supplied articles from their own files.

NUMBER OF SOURCE DOCUMENTS

Four articles

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

Strength of Evidence

Literature Classification Schema[^]

Design/ Class	Therapy*	Diagnosis**	Prognosis***
1	Randomized, controlled trial or meta-analyses of randomized trials	Prospective cohort using a criterion standard	Population prospective cohort
2	Nonrandomized trial	Retrospective observational	Retrospective cohort Case control
3	Case series Case report Other (e.g., consensus, review)	Case series Case report Other (e.g., consensus, review)	Case series Case report Other (e.g., consensus, review)

[^] Some designs (e.g., surveys) will not fit this schema and should be assessed individually.

*Objective is to measure therapeutic efficacy comparing ≥ 2 interventions.

**Objective is to determine the sensitivity and specificity of diagnostic tests.

*** Objective is to predict outcome including mortality and morbidity.

Approach to Downgrading Strength of Evidence*

	Design/Class
--	---------------------

Downgrading	1	2	3
None	I	II	III
1 level	II	III	X
2 levels	III	X	X
Fatally flawed	X	X	X

*See "Description of Methods Used to Analyze the Evidence" field for more information.

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

All articles used in the formulation of this clinical policy were graded by at least 2 subcommittee members for strength of evidence and classified by the subcommittee members into 3 classes of evidence on the basis of the design of the study, with design 1 representing the strongest evidence and design 3 representing the weakest evidence for therapeutic, diagnostic, and prognostic clinical reports, respectively (see Appendix A in the original guideline document and the "Rating Scheme for the Strength of the Evidence" field). Articles were then graded on 6 dimensions thought to be most relevant to the development of a clinical guideline: blinded versus nonblinded outcome assessment, blinded or randomized allocation, direct or indirect outcome measures (reliability and validity), biases (e.g., selection, detection, transfer), external validity (i.e., generalizability), and sufficient sample size. Articles received a final grade (Class I, II, III) on the basis of a predetermined formula taking into account design and quality of study (see Appendix B in the original guideline document and the "Rating Scheme for the Strength of the Evidence" field). Articles with fatal flaws were given an "X" grade and not used in formulating recommendations in this policy. Evidence grading was done with respect to the specific data being extracted, and the specific critical question being reviewed. Thus, the level of evidence for any one study may vary according to the question, and it is possible for a single article to receive different levels of grading as different critical questions are answered. Question-specific level of evidence grading may be found in the Evidentiary Table included at the end of the original guideline document.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

This policy is a product of the American College of Emergency Physicians (ACEP) clinical policy development process, including expert review, and is based on the existing literature; where literature was not available, consensus of emergency physicians, toxicologists, and physicians with hyperbaric medicine expertise was used.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Clinical findings and strength of recommendations regarding patient management were made according to the following criteria:

Strength of Recommendations

Level A recommendations. Generally accepted principles for patient management that reflect a high degree of clinical certainty (i.e., based on strength of evidence Class I or overwhelming evidence from strength of evidence Class II studies that directly address all of the issues)

Level B recommendations. Recommendations for patient management that may identify a particular strategy or range of management strategies that reflect moderate clinical certainty (i.e., based on strength of evidence Class II studies that directly address the issue, decision analysis that directly addresses the issue, or strong consensus of strength of evidence Class III studies)

Level C recommendations. Other strategies for patient management that are based on preliminary, inconclusive, or conflicting evidence, or, in the absence of any published literature, based on panel consensus

There are certain circumstances in which the recommendations stemming from a body of evidence should not be rated as highly as the individual studies on which they are based. Factors such as heterogeneity of results, uncertainty about effect magnitude and consequences, strength of prior beliefs, and publication bias, among others, might lead to such a downgrading of recommendations.

COST ANALYSIS

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

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Expert review comments were received from individual physicians with topic expertise and from individual members of the American Academy of Clinical Toxicology, American College of Medical Toxicology, Divers Alert Network, and Undersea and Hyperbaric Medical Society. Expert review comments were also received from members of American College of Emergency Physician's (ACEP's) Toxicology Section and Hyperbaric Medicine Section. Their responses were used to further refine and enhance this policy.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Definitions for the strength of evidence (Class I-III) and strength of recommendations (Level A-C) are repeated at the end of the Major Recommendations.

Should hyperbaric oxygen (HBO₂) therapy be used for the treatment of patients with acute carbon monoxide (CO) poisoning?

Can clinical or laboratory criteria identify CO-poisoned patients who are most or least likely to benefit from this therapy?

Level A recommendations. None specified.

Level B recommendations. None specified.

Level C recommendations.

1. HBO₂ is a therapeutic option for CO-poisoned patients; however, its use cannot be mandated.
2. No clinical variables, including carboxyhemoglobin levels, identify a subgroup of CO-poisoned patients for whom HBO₂ is most likely to provide benefit or cause harm.

Definitions:

Strength of Evidence

Literature Classification Schema[^]

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^ Some designs (e.g., surveys) will not fit this schema and should be assessed individually.

*Objective is to measure therapeutic efficacy comparing ≥ 2 interventions.

**Objective is to determine the sensitivity and specificity of diagnostic tests.

*** Objective is to predict outcome including mortality and morbidity.

Approach to Downgrading Strength of Evidence*

	Design/Class		
Downgrading	1	2	3
None	I	II	III
1 level	II	III	X
2 levels	III	X	X
Fatally flawed	X	X	X

*See "Description of Methods Used to Analyze the Evidence" field for more information.

Strength of Recommendations

Level A recommendations. Generally accepted principles for patient management that reflect a high degree of clinical certainty (i.e., based on strength of evidence Class I or overwhelming evidence from strength of evidence Class II studies that directly address all of the issues)

Level B recommendations. Recommendations for patient management that may identify a particular strategy or range of management strategies that reflect moderate clinical certainty (i.e., based on strength of evidence Class II studies that directly address the issue, decision analysis that directly addresses the issue, or strong consensus of strength of evidence Class III studies)

Level C recommendations. Other strategies for patient management that are based on preliminary, inconclusive, or conflicting evidence, or, in the absence of any published literature, based on panel consensus

There are certain circumstances in which the recommendations stemming from a body of evidence should not be rated as highly as the individual studies on which they are based. Factors such as heterogeneity of results, uncertainty about effect magnitude and consequences, strength of prior beliefs, and publication bias, among others, might lead to such a downgrading of recommendations.

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 "Major Recommendations" field).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate management of adult patients presenting to the emergency department with acute carbon monoxide poisoning

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

Recommendations offered in this policy are not intended to represent the only diagnostic and management options that the emergency physician should consider. The American College of Emergency Physicians (ACEP) clearly recognizes the importance of the individual clinician's judgment. Rather, this clinical policy defines for the physician those strategies for which medical literature exists to provide support for answers to the crucial questions addressed in this policy.

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)

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ADAPTATION

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

DATE RELEASED

2008 Feb

GUIDELINE DEVELOPER(S)

American College of Emergency Physicians - Medical Specialty Society

SOURCE(S) OF FUNDING

American College of Emergency Physicians

GUIDELINE COMMITTEE

Clinical Policies Subcommittee (Writing Committee)

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Clinical Policies Subcommittee (Writing Committee): Stephen J. Wolf, MD (Chair); Eric J. Lavonas, MD; Edward P. Sloan, MD, MPH; Andy S. Jagoda, MD

American College of Emergency Physicians Clinical Policies Committee (Oversight Committee): Andy S. Jagoda, MD, (Chair 2003-2006, Co-Chair 2006-2007); Wyatt W. Decker, MD (Co-Chair 2006-2007); Deborah B. Diercks, MD; Jonathan A. Edlow, MD; Francis M. Fesmire, MD; Steven A. Godwin, MD; Sigrid A. Hahn, MD; John M. Howell, MD; J. Stephen Huff, MD; Thomas W. Lukens, MD, PhD; Donna L. Mason, RN, MS, CEN (ENA Representative 2004-2006); Michael Moon, RN, CNS, MSN, CEN (ENA Representative 2004); Anthony M. Napoli, MD (EMRA Representative 2004-2006); Devorah Nazarian, MD; Jim Richmann, RN, BS, MA(c), CEN (ENA Representative 2006-2007); Scott M. Silvers, MD; Edward P. Sloan, MD, MPH; Molly E. W. Thiessen (EMRA Representative 2006-2007); Robert L. Wears, MD, MS (Methodologist); Stephen J. Wolf, MD; Cherri D. Hobgood, MD (Board Liaison 2004-2006); David C. Seaberg, MD, CPE (Board Liaison 2006-2007); Rhonda R. Whitson, RHIA, Staff Liaison, Clinical Policies Committee and Subcommittees

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Relevant industry relationships for the following carbon monoxide poisoning subcommittee members are as follows: Dr. Lavonas was the Medical Director of Hyperbaric Medicine at Carolinas Medical Center, Charlotte, NC during the development of this clinical policy.

Relevant industry relationships are those relationships with companies associated with products or services that significantly impact the specific aspect of disease addressed in the critical question.

ENDORSER(S)

Emergency Nurses Association - Medical Specialty Society

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [American College of Emergency Physicians Web site](#).

Print copies: Available from the American College of Emergency Physicians, P.O. Box 619911, Dallas, TX 75261-9911, or call toll free: (800) 798-1822.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI Institute on April 16, 2008. The information was verified by the guideline developer on May 16, 2008.

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