# WORKSHEET for Evidence-Based Review of Science for Emergency Cardiac Care

**Worksheet author(s)**

| Louis Gonzales | Date Submitted for review: May 10, 2009; September 19, 2009 |

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### Clinical question.

In patients with difficulty breathing or chest pain, does administration of oxygen improve outcome?

#### Is this question addressing an intervention/therapy, prognosis or diagnosis?

Intervention/therapy

#### State if this is a proposed new topic or revision of existing worksheet:

This is a both a revision to an existing worksheet and a new question

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### Conflict of interest specific to this question

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? No

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### Search strategy (including electronic databases searched).

- Medline via PubMed
- Dyspnea [MESH] OR "chest pain" [MESH] AND "oxygen inhalation therapy [MESH]
- 379 articles
- "Myocardial infarction" [MESH] AND "oxygen inhalation therapy [MESH]
- 302 articles
- Cochrane Library
- 227 (shortness of breath) and 540 (chest pain/AMI)
- Google Scholar
- No additional articles
- AHA EndNote Library
- 0 (shortness of breath) and 2 (chest pain/AMI)
- Search terms:
  - MESH Terms - Dyspnea, Chest Pain, Oxygen Inhalation Therapy
  - Shortness of Breath AND Oxygen Administration, Supplemental Oxygen, Oxygen Inhalation Therapy, Oxygen Delivery;
  - First Aid AND Shortness of Breath; Lay Rescuer AND Shortness of Breath;
  - Breathlessness AND Oxygen Administration;
  - Chest Pain AND Oxygen Delivery, Oxygen Administration, Supplemental Oxygen;
  - Acute Myocardial Infarction OR AMI AND Oxygen Delivery, Oxygen Administration, Supplemental Oxygen

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### State inclusion and exclusion criteria

This evidence review excluded articles which were not related to the worksheet question. These articles were excluded since they did not meet the patient population of “shortness of breath” or “chest pain”, were editorial opinions or were not published in peer reviewed journals. Articles focused on long term oxygen use, oxygen for chronic illness and oxygen for palliative care were also excluded. Two of these articles were included in the 2005 evidence evaluation worksheet but were excluded in this review. These were excluded based on the revised question or because they were not published in peer reviewed journals (consensus opinions not from scientific organizations). One article was excluded because an abstract only was available.

Articles which met the patient population (shortness of breath or chest pain) were included if they were Systematic Reviews or published in peer reviewed journals. One editorial on the topic of breathlessness was also included.

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### Number of articles/sources meeting criteria for further review:

After excluding the articles noted above, 9 remaining articles met criteria for further review. Of the 9 articles, 0 were LOE 1, 3 were LOE 2, 1 was LOE 3, 1 was LOE 4 and 4 were LOE 5. The LOE 5 articles were all animal studies.
# Summary of evidence

## Evidence Supporting Clinical Question

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Evidence Supporting Clinical Question</th>
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<tbody>
<tr>
<td>Good</td>
<td>Longphre JM 2007 (A,B)</td>
</tr>
<tr>
<td>Fair</td>
<td>Madias JE 1976 (D)</td>
</tr>
<tr>
<td>Poor</td>
<td>Maroko PR 1975 (D)</td>
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### Level of evidence

- **A**: symptom relief
- **B**: reduced recompressions
- **C**: Survival to hospital discharge
- **D**: Reduced ST elevation/infarct size
- **E**: Other endpoint

*Italic* = Animal studies

## Evidence Neutral to Clinical question

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<thead>
<tr>
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<tbody>
<tr>
<td>Good</td>
<td>Nicholson C 2004 (E)</td>
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<td></td>
<td>Austin M 2006 (E)</td>
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<td>Fair</td>
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### Level of evidence

- **A**: symptom relief
- **B**: reduced recompressions
- **C**: Survival to hospital discharge
- **D**: Reduced ST elevation/infarct size
- **E**: Other endpoint

*Italic* = Animal studies
## Evidence Opposing Clinical Question

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<td>Rawles JM 1976 (E)</td>
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<td>Malm A 1977 (E)</td>
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<td>Weisse AB 1982 (E)</td>
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Since the 2005 Evidence Evaluation Process, four articles related to oxygen administration and either shortness of breath of chest pain (AMI) have been published. It should be noted that the current question is slightly modified as compared to the question evaluated in the 2005 process. Only one of these four articles, Longphre 2007 LOE 3, specifically addressed oxygen administration in the first aid setting. This one specific article focuses on victims with symptoms including shortness of breath related to decompression illness (underwater diving incidents). This retrospective case study found victims who received first aid oxygen required fewer recompression treatments and had an increased likelihood of complete recovery. In 2006, Austin LOE 2 performed a systematic review of the literature in search of randomized controlled trials comparing various oxygen therapies used for COPD exacerbations in the prehospital setting. Austin concluded that no randomized controlled trials evaluating different oxygen therapies for the treatment of COPD exacerbation in the prehospital setting were available. No other articles addressed the shortness of breath patient population addressed in this evidence evaluation question.

Eight articles were found which addressed the effect of oxygen in the victim with chest pain or suspected acute myocardial infarction. One small case series, Madias 1976 LOE 4, reported reduction in ST segment elevation when 15 lpm oxygen by mask was provided. Three small animal studies evaluated the effects of oxygen administration on ischemic myocardium. Two of these animal studies (Kelly 1995LOE 5, Maroko 1975 LOE 5) suggested a reduction in infarct size when oxygen was administered. The third study (Weisse 1982 LOE 5) found no evidence to support the reduction in infarct size findings of the other animal studies. A fifth study (Rawles 1976 LOE 2) also found no evidence supporting routine oxygen administration in the uncomplicated acute MI victim.

Finally, Nicholson (2004 LOE 2) conducted a systematic review of randomized and non-randomized controlled trials to evaluate oxygen therapy as a treatment for acute myocardial ischemia. Nicholson did not find evidence supporting the routine use of oxygen therapy in the treatment of myocardial ischemia.

With the exception of Longphre’s (2007 LOE 3) findings, the available scientific evidence of benefit of oxygen for shortness of breath or chest pain is minimal. Rawles, Weisse and Malm suggest potential harmful effects of routine oxygen administration in the AMI patient. However, their findings did not support their suggestions of harmful effects and these studies were conducted in an era with vastly different approaches to AMI treatment . Therefore, there is no convincing evidence of harm in victims with shortness of breath or chest pain. It should be noted, however, that Longphre’s study is the only one demonstrating apparently safe use of oxygen administration by first aid rescuers.

Supporting evidence for first aid oxygen in injured divers appeared to be demonstrated by Longphre. However, this is a single study with a number of limitations acknowledged by the authors. Though limited evidence supported the use of oxygen for chest pain associated with acute myocardial infarction, this practice has been consistently supported by experts for use by healthcare providers. No supporting expert opinion was found for oxygen administration by first aid rescuers.

Acknowledgements:

Citation List

Reference Type: Journal Article
Record Number: CD005534
Author: Austin M, Wood-Baker R
Year: 2006
Title: Oxygen therapy in the prehospital setting for acute exacerbations of chronic obstructive pulmonary disease (Review)
Journal: Cochrane Database of Systematic Reviews
Issue: 3

LOE 2, Good, Neutral
Reference Type: Journal Article
Record Number: 13641
Author: R. F. Kelly, T. L. Hursey, J. E. Parrillo and G. L. Schaer
Year: 1995
Title: Effect of 100% oxygen administration on infarct size and left ventricular function in a canine model of myocardial infarction and reperfusion
Journal: Am Heart J
Volume: 130
Issue: 5
Pages: 957-965
Date: Nov
Short Title: Effect of 100% oxygen administration on infarct size and left ventricular function in a canine model of myocardial infarction and reperfusion
Accession Number: 7484756
Keywords: Animals
Collateral Circulation
Coronary Circulation
Disease Models, Animal
Dogs
Male
Myocardial Infarction/pathology/*physiopathology/*therapy
*Myocardial Reperfusion
*Oxygen Inhalation Therapy
Research Support, Non-U.S. Gov't
*Ventricular Function, Left

LOE 5, Poor, Supports

Title: First aid normobaric oxygen for the treatment of recreational diving injuries
Authors: Longphre JM, Denoble PJ, Moon RE, Vann RD, Freiberger JJ
Keywords: Oxygen, first aid, first aid oxygen, emergency treatment, diving injury, recompression treatment, human, outcome
Issue Date: 2007
Publisher: Undersea and Hyperbaric Medical Society, Inc
Citation: Undersea Hyperb Med. 2007 Jan-Feb;34(1):43-9.
URI: http://archive.rubicon-foundation.org/5514
Appears in Collections: Undersea and Hyperbaric Medicine Journal

LOE 3, Good, Supports

Reference Type: Journal Article
Record Number: 13645
Author: J. E. Madias and W. B. Hood, Jr.
Year: 1976
Title: Reduction of precordial ST-segment elevation in patients with anterior myocardial infarction by oxygen breathing
Journal: Circulation
Short Title: Reduction of precordial ST-segment elevation in patients with anterior myocardial infarction by oxygen breathing

Accession Number: 1253359

Keywords: Adult
Aged
Animals
Blood Pressure
*Electrocardiography
Heart Rate
Humans
Middle Aged
Myocardial Infarction/diagnosis/physiopathology/*therapy
*Oxygen Inhalation Therapy
Research Support, U.S. Gov't, P.H.S.
Notes: Journal Article