TITLE: Humidified versus Non-Humidified Oxygen Therapy: Comparative Clinical Effectiveness and Guidelines

DATE: 05 May 2015

RESEARCH QUESTIONS

1. What is the clinical effectiveness of humidified oxygen versus non-humidified oxygen for patients requiring short-term oxygen therapy?

2. What is the clinical effectiveness of humidified oxygen versus non-humidified oxygen for patients requiring long-term oxygen therapy?

3. What are the evidence-based guidelines regarding the use of humidified oxygen for short or long-term oxygen therapy?

KEY FINDINGS

One systematic review, two randomized controlled trials and two non-randomized studies were identified regarding the clinical effectiveness of humidified oxygen versus non-humidified oxygen for patients requiring short or long-term oxygen therapy. In addition, two evidence-based guidelines were identified regarding the use of humidified oxygen for short or long-term oxygen therapy.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2010 and April 21, 2015. Internet links were provided, where available.
The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

**SELECTION CRITERIA**

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

<table>
<thead>
<tr>
<th>Table 1: Selection Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population</strong></td>
</tr>
<tr>
<td>Adult patients requiring short or long-term oxygen therapy (excluding individuals under anesthesia or receiving mechanical ventilation)</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
</tr>
<tr>
<td>Humidified bedside or portable oxygen therapy</td>
</tr>
<tr>
<td><strong>Comparator</strong></td>
</tr>
<tr>
<td>Non-humidified bedside or portable oxygen therapy</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
</tr>
<tr>
<td>Q1 and 2: Comparative clinical effectiveness, patient satisfaction, harms Q3: Guidelines and recommendations</td>
</tr>
<tr>
<td><strong>Study Designs</strong></td>
</tr>
<tr>
<td>Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, evidence-based guidelines</td>
</tr>
</tbody>
</table>

**RESULTS**

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, and evidence-based guidelines.

One systematic review, two randomized controlled trials and two non-randomized studies were identified regarding the clinical effectiveness of humidified oxygen versus non-humidified oxygen for patients requiring short or long-term oxygen therapy. In addition, two evidence-based guidelines were identified regarding the use of humidified oxygen for short or long-term oxygen therapy. No relevant health technology assessments were identified.

Additional references of potential interest are provided in the appendix.

**OVERALL SUMMARY OF FINDINGS**

One systematic review,1 two randomized controlled trials2,3 and two non-randomized studies4,5 were identified regarding the clinical effectiveness of humidified oxygen versus non-humidified oxygen for patients requiring short or long-term oxygen therapy. In addition, two evidence-based guidelines6,7 were identified regarding the use of humidified oxygen for short or long-term oxygen therapy.

A detailed summary of clinical effectiveness evidence is provided in Table 2. Potential benefits of using humidified oxygen versus non-humidified oxygen in various patient populations were reported, including: improved respiratory outcomes,1,5 reduced dryness,2 reduced chronic obstructive pulmonary disease (COPD) exacerbations,3 improved long-term quality of life and lung function,3 and reduced risk for mechanical ventilation need.4 However, no differences in ventilation,1 long-term outcomes,1 and upper airway caliber6 were reported.
<table>
<thead>
<tr>
<th>First author, publication year</th>
<th>Patients, n</th>
<th>Intervention</th>
<th>Comparator</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systematic Reviews</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kernick, 2010^1</td>
<td>Patients in critical care units, n = 8 studies</td>
<td>Humidified HFNC oxygen</td>
<td>Standard oxygen therapy</td>
<td>• Improved oxygenation in treatment group</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Patients described intervention as comfortable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• No evidence to support improved ventilation or long-term outcomes</td>
</tr>
<tr>
<td><strong>Randomized Controlled Trials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cuquemelle, 2012^2</td>
<td>Patients with acute hypoxemic respiratory failure in ICU, n = 30</td>
<td>Heated and humidified high-flow oxygen therapy</td>
<td>Standard oxygen therapy</td>
<td>• No difference in upper airway caliber as measured by acoustic rhinometry</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Significantly lower dryness score in treatment group up to 24 hours</td>
</tr>
<tr>
<td>Rea, 2010^3</td>
<td>Patients with COPD or bronchiectasis, n = 108</td>
<td>Fully humidified HFNC oxygen</td>
<td>Usual care</td>
<td>• Fewer exacerbation days, increased time to first exacerbation, and reduced exacerbation frequency in treatment group</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Improved quality of life and lung function at 3 and 12 months</td>
</tr>
<tr>
<td><strong>Non-Randomized Studies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roca, 2014^4</td>
<td>Lung transplant recipients readmitted to ICU due to acute respiratory failure, n = 37</td>
<td>Humidified HFNC oxygen</td>
<td>Conventional oxygen therapy</td>
<td>• Reduced risk of subsequent mechanical ventilation need in treatment group</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• No safety concerns with use of HFNC</td>
</tr>
<tr>
<td>Sztrymf, 2012^5</td>
<td>Patients with acute respiratory failure, n = 20</td>
<td>Heated and humidified HFNC</td>
<td>Conventional oxygen therapy</td>
<td>• Respiratory rate significantly reduced, oxygen saturation significantly increased, and partial pressure of oxygen significantly increased in treatment group</td>
</tr>
</tbody>
</table>

COPD = chronic obstructive pulmonary disease; HFNC = high flow nasal cannula; ICU = intensive care units; n = number

The evidence-based guidelines were produced by the Korean Academy of Nursing Administration,^6^ and the Spanish Ministry for Health and Social Policy.^7^ The Korean guideline states that when supplying oxygen under four liters per minute by nasal cannula, non-humidified oxygen should be used due to lack of patient perceived differences with humidified oxygen.^6^ The Spanish guideline states that in patients with acute bronchiolitis, oxygen therapy should be warmed and humidified.^7^
REFERENCES SUMMARIZED

Health Technology Assessments
No literature identified.

Systematic Reviews and Meta-analyses

   PubMed: PM20206546

Randomized Controlled Trials

   PubMed: PM22417569

   PubMed: PM20144858

Non-Randomized Studies

   PubMed: PM25340596

   PubMed: PM21958974

Guidelines and Recommendations


See: Treatment – Oxygen, page 22.
    Recommendations, page 57.

PREPARED BY:
Canadian Agency for Drugs and Technologies in Health
Tel: 1-866-898-8439
www.cadth.ca
Guidelines and Recommendations – Unclear Methodology

   See: Indications, page 4
   Assessment for Humidification, page 6

   See: Indications of HFNP, page 1

    See: Oxygen Therapy and Humidity, page 34.

    See: Indications of HFNP, page 1

    See: 1. Indications
        2. Clinical Management

    See: Indications for use, page 7

    See: C. Humidification, page 5
Review Articles