



**TITLE: Humidified Continuous Positive Airway Pressure Devices for Adults with Obstructive Sleep Apnea: Clinical Effectiveness and Cost-Effectiveness**

**DATE:** 12 December 2016

## **RESEARCH QUESTIONS**

1. What is the comparative clinical effectiveness of humidified continuous positive airway pressure (CPAP) versus non-humidified CPAP for adult patients with obstructive sleep apnea?
2. What is the cost-effectiveness of humidified CPAP for adult patients with obstructive sleep apnea?

## **KEY FINDINGS**

One health technology assessment, six randomized controlled trials, and one non-randomized study were identified regarding the comparative clinical effectiveness of humidified CPAP versus non-humidified CPAP for adult patients with obstructive sleep apnea.

## **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, 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, 2011 and November 28, 2016. 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.

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## SELECTION CRITERIA

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

**Table 1: Selection Criteria**

<b>Population</b>	Adult patients with obstructive sleep apnea
<b>Intervention</b>	CPAP devices with humidification
<b>Comparator</b>	CPAP without humidification
<b>Outcomes</b>	Q1: clinical effectiveness (e.g., health related quality of life, harms and benefits) Q2: cost-effectiveness (e.g., cost per quality adjusted life year, incremental cost-effectiveness ratio)
<b>Study Designs</b>	Health technology assessment reports, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, economic evaluations

CPAP = continuous positive airway pressure.

## 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 economic evaluations.

One health technology assessment, six randomized controlled trials, and one non-randomized study were identified regarding the comparative clinical effectiveness of humidified CPAP versus non-humidified CPAP for adult patients with obstructive sleep apnea. No relevant systematic reviews, meta-analyses, or economic analyses were identified.

Additional articles are available in the appendix.

## OVERALL SUMMARY OF FINDINGS

One health technology assessment<sup>1</sup> was identified. The authors assessed five clinical trials and determined that there was not enough evidence to determine whether there was a difference between humidified and non-humidified continuous positive airway pressure (CPAP) in regards to compliance or clinical outcomes.<sup>1</sup>

Five randomized controlled trials<sup>2-6</sup> (RCTs) were identified. Heated humidified CPAP was compared with non-humidified CPAP in cool sleeping environments.<sup>2</sup> A significant reduction in upper airway symptoms was reported in the humidified CPAP group.<sup>2</sup> No significant differences were reported between the two groups in apnea hypopnea index (AHI) reduction, optimal CPAP pressure, or leak.<sup>2</sup> In one RCT,<sup>3</sup> patients with obstructive sleep apnea (OSA) with nasopharyngeal symptoms were randomized to receive heated humidified CPAP or non-humidified CPAP for four weeks and then crossed over to the other treatment.<sup>3</sup> There was a non-significant improvement in the average hours of use with heated humidified CPAP and adherence on days of use. An improved quality of life score and significant reduction in dry or sore throat symptoms were reported in the humidified CPAP group.<sup>3</sup> A second RCT<sup>4</sup> examining patients with OSA with nasopharyngeal symptoms found nasopharyngeal symptoms were improved in the heated humidified CPAP group. Sleep improvement, willingness to use CPAP, leak, AHI reduction, and optimal CPAP pressure were not significantly different between

groups.<sup>4</sup> In another study,<sup>5</sup> patients with OSA were randomized to receive heated humidified CPAP or CPAP with sham-heated humidification for three weeks and then crossed over to receive the other treatment for three weeks. Nasal symptoms were decreased with heated humidified CPAP. When heated humidified CPAP was used by patients at home in another RCT,<sup>6</sup> a significant decrease in mouth dryness was observed in the heated humidified CPAP group during the first two nights. Waking up to wetness on the face had also increased.

One non-randomized study<sup>7</sup> followed patients with OSA for one year. The authors found that mouth dryness score decreased significantly in patients who received either humidified or non-humidified CPAP. The use of humidification prevented the aggravations of runny nose and significantly improved nasal stuffiness.

No relevant economic evaluations were identified.

## REFERENCES SUMMARIZED

### Health Technology Assessments

1. Diagnosis and treatment of obstructive sleep apnea in adults [Internet]. Rockville (MD): Agency for Healthcare Research and Quality; 2011 Jul. [cited 2016 Dec 12]. (Comparative effectiveness review 32). Available from: [https://www.effectivehealthcare.ahrq.gov/ehc/products/117/683/CER32\\_SleepApnea\\_FinalReview\\_201108.pdf](https://www.effectivehealthcare.ahrq.gov/ehc/products/117/683/CER32_SleepApnea_FinalReview_201108.pdf)  
*See: Comparison of Humidification in CPAP, page ES-8*

### Systematic Reviews and Meta-analyses

No literature identified.

### Randomized Controlled Trials

2. Li Y, Wang Y. The benefit of HH during the CPAP titration in the cool sleeping environment. *Sleep Breath*. 2016 May 18.  
[PubMed: PM27193744](#)
3. Soudorn C, Muntham D, Reutrakul S, Chirakalwasan N. Effect of Heated Humidification on CPAP Therapy Adherence in Subjects With Obstructive Sleep Apnea With Nasopharyngeal Symptoms. *Respir Care*. 2016 Sep;61(9):1151-9.  
[PubMed: PM27220350](#)
4. Yu CC, Luo CM, Liu YC, Wu HP. The effects of heated humidifier in continuous positive airway pressure titration. *Sleep Breath*. 2013 Mar;17(1):133-8. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3575558>  
[PubMed: PM22311554](#)
5. Koutsourelakis I, Vagiakis E, Perraki E, Karatza M, Magkou C, Kopaka M, et al. Nasal inflammation in sleep apnoea patients using CPAP and effect of heated humidification. *Eur Respir J*. 2011 Mar;37(3):587-94.  
[PubMed: PM20595158](#)
6. Ruhle KH, Franke KJ, Domanski U, Nilius G. Quality of life, compliance, sleep and nasopharyngeal side effects during CPAP therapy with and without controlled heated humidification. *Sleep Breath*. 2011 Sep;15(3):479-85.  
[PubMed: PM20503074](#)

### Non-Randomized Studies

7. Kreivi HR, Maasilta P, Bachour A. Persistence of Upper-Airway Symptoms During CPAP Compromises Adherence at 1 Year. *Respir Care*. 2016 May;61(5):652-7.  
[PubMed: PM26732141](#)

**Economic Evaluations**

No literature identified.

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**APPENDIX – FURTHER INFORMATION:**

**Randomized Controlled Trials – Alternate Comparator**

8. Galetke W, Nothofer E, Priegnitz C, Anduleit N, Randerath W. Effect of a Heated Breathing Tube on Efficacy, Adherence and Side Effects during Continuous Positive Airway Pressure Therapy in Obstructive Sleep Apnea. *Respiration*. 2016;91(1):18-25.  
[PubMed: PM26727475](#)

**Additional References**

9. Karamanli H. Effect of Heated Humidification on Adherence to Continuous Positive Airway Pressure Therapy in Subjects With Obstructive Sleep Apnea and Nasopharyngeal Symptoms. *Respir Care*. 2016 Sep;61(9):1270-2.  
[PubMed: PM27587870](#)