Changing heat and moisture exchangers (HMEs) less than every 24 hours?

B.S. Niël-Weise[1], P.J. van den Broek[2]
[1]Dutch Infection Prevention Working Party, Leiden, The Netherlands
[2]Department of Infectious Diseases, Leiden University Medical Centre

Study population: mechanically ventilated intensive care patients
Comparison: less frequent changes HME versus more frequent changes HME
Outcome: ventilator-associated pneumonia

Methods

Data sources

Publications were retrieved by a search of Medline and the Cochrane Library up to february 2006. Terms included were 'pneumonia' and 'ventilator*' and 'heat and moisture exchanger*'. To identify randomised controlled trials in Medline the following search strategy was used: (humid* OR humidification OR circuit* OR humidity OR humidifier OR humidifiers OR heat and moisture exchanger* OR artificial nose) AND ((((ventilator associated pneumonia) OR (VAP AND (pneumonia OR pneum*)) OR ("Respiration, Artificial"[MAJR] AND pneumonia) OR (ventilated AND pneumonia) OR (ventilation AND pneumonia)) AND (((randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized controlled trials[mh] OR random allocation[mh] OR double-blind method[mh] OR single-blind method[mh] OR clinical trial[pt] OR clinical trials[mh] OR ("clinical trial"[tw]) OR ((singl*[tw] OR doubl*[tw] OR trebl*[tw] OR tripl*[tw]) AND (mask*[tw] OR blind*[tw])) OR ("latin square"[tw]) OR placebos[mh] OR placebo*[tw] OR random*[tw] OR research design[mh:noexp] OR comparative study[mh] OR evaluation studies[mh] OR follow-up studies[mh] OR prospective studies[mh] OR cross-over studies[mh] OR control*[tw] OR prospective*[tw] OR volunteer*[tw]) NOT (animal[mh] NOT human[mh])))))). Additionally, all reference lists of identified trials were examined.

Selection criteria

All randomised and quasi-randomised trials comparing less frequent changes HME with more frequent changes HME and ventilator-associated pneumonia as the outcome measure.

Review methods

Data were extracted by two reviewers independently and compared. Disagreements were resolved by discussion. Data from the original publications were used to calculate the relative risk of ventilator-associated pneumonia. Data for similar outcomes were combined in the analysis where appropriate, using a random-effects model.

Results

Two parallel-group randomised controlled trials were included (1, 2).

Study population, interventions and outcome definitions
See Table I

Validity assessment
See Table II

Summary estimates of associations between treatment and control group
See Figure I

Table I: Study population, interventions and outcome definitions

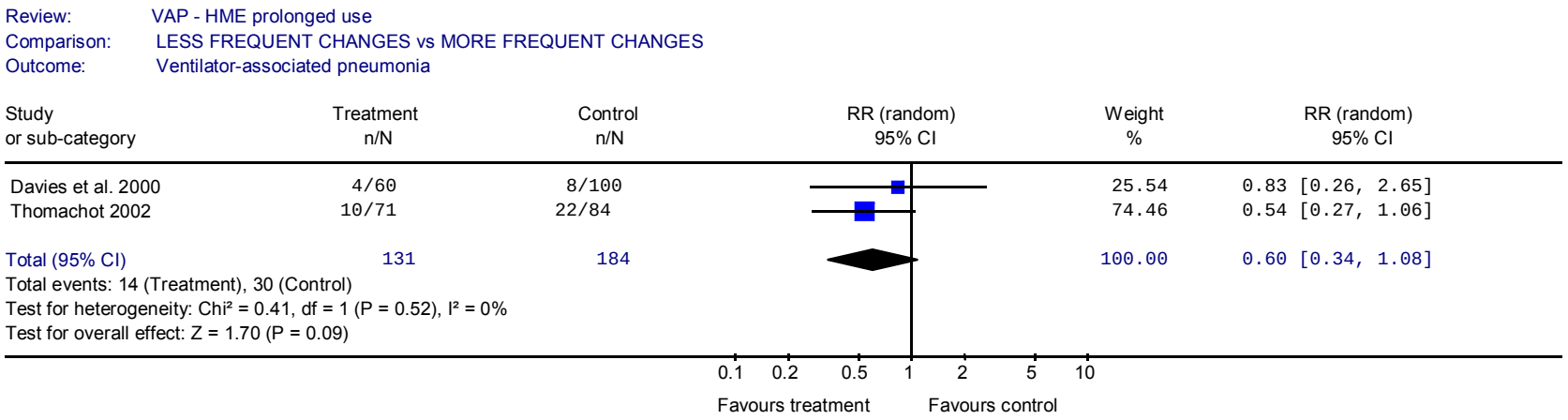
	Participants	**Interventions**	**Definition of ventilator associated pneumonia (VAP)**	**Notes**
Thomachot et al. 2002	Incl: trauma, surgical and medical ICU patients, ventilation ≥48 hrs Excl: hypothermia <33^{0}C, bronchopleural fistel Mean number of ventilation days (SD): 8.6 (7.7); C: 9.5 (8.0)	Treatment (71 analyzed): HMEs changed once a week Control (84 analyzed): HMEs changed every 24 hrs Notes: 1) HMEs changed more frequently if necessary; 2) hydrophobic Thermovent Hepa+ (Sims Portex Ltd, UK); 3) HMEs were placed between the endotracheal tube and the Y-piece,	VAP was defined as purulent ETS or worsening of PaO_2 and new infiltrates and a positive quantitative culture from a distal airway sample (BAL ≥ 10^4 CFU/ml or PSB ≥ 10^3 CFU/ml)	Did not report the number of HMEs used in each group.

		vertically above the tracheal tube End of the study protocol: not reported		
Davies et al. 2000	Incl: surgical IC patients, ventilation ≤ 3 days, meeting the criteria for HME use Excl: ventilation < 48 hrs Mean number of ventilation days (SD): not relevant in this setting	Treatment (60 analyzed): hygroscopic HME changed every 120 hrs Control (100 analyzed): hygroscopic HME changed every 24 hrs C: 8/100 Note: 1) Aqua+, hudson-RCI, Temecula, CA End of the study protocol: after 3 days	VAP was defined as new or progressive infiltrate and new onset of fever >38.0^{0}C and new onset of purulent sputum or change in sputum character and positive ETS or bronchial washing; > 24 hrs after initiation of ventilation and before extubation	Randomization into three groups: 1) hygroscopic HME changed every 24hrs 2) Hydrophobic HME changed every 120 hrs 3) hygroscopic HME changed every 120 hrs

Table II: Data on quality assessment

Thomachot et al. 2002	*Generation of allocation sequence:* *Concealment of allocation:* *Blinding attending physician:* *Blinding outcome assessors:* *Description of dropouts:* *Analysis by intention-to-treat:*	Not reported Unclear No No No Unclear
Davies et al. 2000	*Generation of allocation sequence:* *Concealment of allocation:* *Blinding attending physician:* *Blinding outcome assessors:* *Description of dropouts:* *Analysis by intention-to-treat:*	Not reported Unclear No No No Unclear

Figure I: Summary estimates of associations between treatment and control group expressed as relative risk (RR) and 95% confidence interval (CI) using a random effects model



Conclusion

The evidence of two trials indicates that HMEs should be changed less than every 24 hours. The evidence, however, was very low because of small sample sizes and insufficient methodological quality.

References

1. Thomachot L, Leone M, Razzouk K, Antonini F, Vialet R, Martin C. Randomized clinical trial of extended use of a hydrophobic condenser humidifier: 1 vs. 7 days. Crit Care Med 2002;30(1):232-7.
2. Davis K, Evans SL, Campbell RS, Johannigman JA, Luchette FA, Porembka DT, et al. Prolonged use of heat and moisture exchangers does not affect device efficiency or frequency rate of nosocomial pneumonia. Crit Care Med 2000;28(5):1412-18.