

Title: DO HEATED HUMIDIFIERS OR HEAT AND MOISTURE EXCHANGERS REALLY PREVENT TEMPERATURE DROP DURING SURGERY?

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Introduction: Passive heat and moisture exchangers (HME) and heated humidifiers (HH) have been used to maintain temperature during surgical procedures. Prior studies suggest that the HH is more effective than the HME and both are more effective than no device (N).^{1,2} More recently, we demonstrated that the HME had no advantage over N in short procedures (45-60 mins).³ The purpose of this study was to compare in a controlled fashion the effects on temperature of the use of a HH, HME or no device for procedures of 1-4 hours duration.

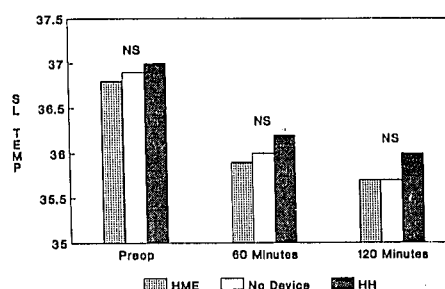
Methods: The study was approved by our institutional review board and informed consent was obtained. Fifty-one ASA Class I-III patients, ages 16-69 scheduled for a variety of procedures anticipated to last 1-4 hours were selected. Patients were randomly assigned to one of three groups utilizing either a HME (Pall Corp, Glen Cove, NY) an electric humidifier (Fisher-Paykel) (HH) or no device (N). Sublingual temperatures were determined 5 mins prior to induction; then every 15 min during the operation and while in the recovery room (RR). Esophageal temperatures were obtained every 15 min during anesthesia with a temperature probe positioned at the site of greatest temperature. Ambient operating and recovery room temperatures were recorded and allowed to vary. Fluids were administered at room temperature with the exception of blood which was warmed to 36°C. A warming blanket was not used. Induction of anesthesia consisted of 3 mg of d-tubocurarine, 4-6 mg/kg TPT and 1.5 mg succinylcholine to facilitate intubation. Following intubation maintenance consisted of 60% N₂O with O₂, 1-3 µg/kg fentanyl, 1.2% isoflurane end tidal and vecuronium as needed to maintain muscle relaxation. All gases were administered at a total flow rate of 5L. Recovery room nursing personnel who were blinded to the patient group, recorded the presence of shivering or complaints of cold and temperatures.

Results: No significant difference was found among the three groups for age, weight, duration of surgery, fluid administration, ambient temperatures of operating room and recovery room and amount of IV anesthetic agents administered. Temperature dropped significantly from baseline values in all three groups in the first 60 min ($p < 0.01$) (Graph I) without further decrease after 120 mins of surgery. Admission temperature to the PACU was not significantly different among the 3 groups. Patients without a device shivered (6/16) and felt cold (8/16) significantly more often ($p < 0.05$) than patients in the HH (0/19, 1/19) group but not the HME group (4/14, 3/14). There was no difference in the incidence of shivering or feeling cold

between the HH and HME groups. There was a significant relationship between temperature on arrival to the PACU and shivering ($p < 0.05$), but not with patients perception of feeling cold.

Discussion: Several studies have addressed the ability of both HH and HME to maintain body temperature during anesthesia; however, these were plagued by confounding factors.^{1,2,4} Our study attempted to control many of the variable factors such as concentration of inhalation agent utilized and intravenous anesthetic administered. We also found no difference in the operating room or recovery room temperature, type of surgery, surgical time, the temperature the humidifier was set at (37°C), or the amount of fluids administered. No heating blankets or fluid warmers were utilized except in one patient in N and HME groups where blood transfusion was needed. We therefore, believe that maintenance of body temperature would have been influenced primarily by the use or lack of use of a device. The results of the study show that temperature drop consistently occurs within the first hour of surgery and there is no difference in the ability of the three devices to maintain temperature. Despite no significant temperature difference at the end of surgery more patients in the N group felt cold and shivered on arrival to the PACU as compared to HH. The incidence of shivering and feeling cold was not different between HH and HME or N and HME. The explanation for this beneficial effect of HH is unclear.

Temperature Study



References:

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2. Haslam KR et al: Anesthesiology 64:379-381, 1986
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