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April 2004

Title: Temperature measurement in critically-ill orally intubated adults:
a comparison of pulmonary artery, tympanic, axillary and rectal methods

ABSTRACT

Background: A clinically useful temperature measurement method should correlate and agree well with core body temperature. Although infrared tympanic thermometers are widely used in clinical practice, there are still debates on their accuracies and their abilities to replace conventional temperature measurement methods such as rectal or axillary temperature in local intensive care units.

Objectives: To determine which non-invasive temperature measurement method is the best alternative to the invasive pulmonary artery catheter measured core body temperature in orally-intubated local intensive care unit patients.

Methods: Patients with pulmonary artery catheters in situ were recruited into the study. Pulmonary artery temperature was regarded as the gold standard of core body temperature. Ear temperature readings taken by infrared thermometer, axillary temperature and rectal temperature measured by electronic thermometer were evaluated against the pulmonary artery temperature.

Results: Seventeen patients with pulmonary artery catheter in intensive care unit were recruited into the study. Rectal temperature (RT) demonstrated the best correlation with pulmonary artery temperature (PAT) ($R = 0.96$), followed by ear temperature (ET) ($R = 0.72$) and axillary temperature (AT) ($R = 0.58$). AT was 0.9, 0.7 and 1.0 °C lower than PAT, ET and RT, respectively. There was no significant difference between PAT, ET and RT. RT (-0.1 ± 0.3 °C) demonstrated the best agreement with PAT, followed by ET (0.2 ± 0.6 °C) and AT (0.9 ± 0.9 °C). Using $PAT > 37.8$ °C as definition of fever, sensitivities of ET, AT and RT were 0.8, 0.7 and 0.7 respectively, whereas specificities were 0.71, 1.0 and 1.0, respectively.

Conclusion: Both ET and RT were reasonably good non-invasive alternatives to PAT in estimating body temperature in local intensive care unit, providing there is consistency in temperature measurement and documentation of measurement sites. AT cannot be recommended in view of its poor correlation and agreement with PAT.