Monitoring urinary bladder temperature in the intensive care unit: state of the science

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Authors' objectives
To provide a comprehensive and critical review of research undertaken in intensive care units to compare body temperatures measured in the urinary bladder (UBT) with core temperatures measured at the pulmonary artery (PAT).

Searching
MEDLINE, CINAHL, Current Contents and ProQuest Digital Dissertation Abstracts were searched for publications in the English language from 1980 onwards (end date not given). The search terms were 'bladder temperature', 'pulmonary artery temperature', 'body temperature', 'intensive care' and 'critical care'. Reference lists were handsearched.

Study selection
Study designs of evaluations included in the review
Any study comparing UBT with PAT was included.

Specific interventions included in the review
The specific intervention was the measurement of UBT with temperature-sensing indwelling urinary catheters. This was compared with PAT measurement using a temperature-sensing pulmonary artery catheter.

Participants included in the review
Patients in intensive care units were eligible. The patients were hypothermic, with or without shivering, normothermic or febrile. Their age ranged from 27 to 84 years.

Outcomes assessed in the review
Differences between UBT and PAT were assessed.

How were decisions on the relevance of primary studies made?
The author does not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The author does not state that they assessed validity.

Data extraction
The author does not state how the data were extracted for the review. The tabulated data included demographics, procedures and instrument testing. The results were extracted, or calculated in a single instance.

Methods of synthesis
How were the studies combined?
The study details were tabulated and discussed in the narrative. The author does not report a method for combining the studies.

How were differences between studies investigated?
The author does not report a method for investigating differences between the studies.

Results of the review
Eight observational studies conducted with 226 patients (61 women; gender not identified in one study n=5) were included. A total of 126 patients were identified as having undergone cardiac or vascular surgery.

UBT was similar to, or slightly higher than PAT in normothermic patients. This relationship was reversed in hypothermic or shivering patients. Moderate to high correlations (r: 0.78 to 0.99) between UBT and PAT were found in 3 studies.

**Authors' conclusions**
The studies support the use of UBT as a reliable index of core temperature during times of thermal stability.

**CRD commentary**
The review asked a clear question, and used an appropriate search strategy to locate relevant papers. The criteria and methods used to assess validity were not given. No experimental studies were found, so the review is based on reports using small convenience samples and natural circumstances. Some results suggested that the measured values correlate well with those of other core areas, but they are not definitive because of the lack of experimental designs. In any case, UBT values are strongly dependent on changing urine volume, urine flow and renal perfusion.

**Implications of the review for practice and research**
Practice: The author states that for critically ill patients whose condition necessitates the use of an indwelling urinary catheter, bladder temperature monitoring eliminates the need to use alternative sites.

Research: The author calls for further studies on the effects of shivering and urinary flow rate on temperatures measured in the bladder in critical care patients. The economics of monitoring UBT requires study.

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