

# Evaluating the Accuracy of Four Temperature Instruments on an Adult Inpatient Oncology Unit

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Accurate determination of temperature in patients with cancer is important because treatment decisions often are based on such information. A reliable temperature reading is critical and may make the difference between sending a patient home from a physician's office or drawing blood cultures, administering antibiotics, and admitting a patient to the hospital. Noninvasive sites to measure temperature are oral, axillary, tympanic, and temporal artery. Use of an electronic probe with a disposable cover is the most common method for oral temperature measurement (*Lippincott's nursing procedures*, 2008). Oral temperature also can be measured with a disposable device that has heat-sensitive dots on a plastic strip that change colors at different levels of temperature. The devices commonly are used for patients who require isolation.

Two methods for temperature monitoring that often are advocated for use in oncology patients with mucositis are tympanic and temporal artery thermometers. Both devices use an infrared heat scanner, which is placed into the ear canal (tympanic) or lightly pressed against the forehead during movement of the temporal artery area.

Research has supported that electronic oral thermometers have a high level of agreement with core body temperatures when compared with invasive thermometry (Erickson & Meyer, 1994; Giuliano, Scott, Elliot, & Giuliano, 1999; Lawson et al., 2007). Studies of tympanic thermometers support that the devices are unreliable for temperature monitor-

ing, primarily because of poor reliability among users and with repeated measurements by the same user (Erickson & Woo, 1994; Giuliano et al.; Klein et al., 1993; Lawson et al.). Despite their poor performance in clinical studies, tympanic thermometers continue to be used in a variety of clinical practice situations.

Limited research is available on the accuracy of temporal artery thermometers (Callahan, 2003; Frommelt, Ott, & Hays, 2008; Greenes & Fleisher, 2001; Hebbar, Fortenberry, Rogers, Merritt, & Easley, 2005; Lawson et al., 2007; Roy, Powell, & Gerson, 2003; Schuh et al., 2004; Siberry, Diener-West, Schappell, & Karron, 2002), and most of the studies were performed in children (Callahan; Greenes & Fleisher; Hebbar et al.; Roy et al.; Schuh et al.; Siberry et al.) or had inappropriate statistical analyses (Greenes & Fleisher; Roy et al.). Similarly, limited studies have evaluated performance of disposable oral thermometers (Erickson, Meyer, & Woo, 1996; Potter, Schallom, Davis, Sona, & McSweeney, 2003).

Given the paucity of studies of temporal artery and disposable oral thermometers performed to date on adults, additional studies are needed to validate their use

in adult inpatient care situations. The purpose of the current study was to compare different methods for noninvasive measurement of temperature in patients with cancer. Temperature devices studied were a disposable oral thermometer frequently used for patients in isolation, a tympanic thermometer, and a temporal artery thermometer.

## Materials and Methods

The study was conducted on a 19-bed oncology unit of a 485-bed not-for-profit hospital in the Pacific Northwest region of the United States and was approved by the health system's institutional review board.

## Study Design

A method-comparison design was used to evaluate different methods for temperature monitoring (disposable oral, tympanic, and temporal artery), with an electronic oral temperature serving as the clinical reference standard. Each subject served as his or her own control. The primary dependent variable was the difference in temperature indicated by each test temperature device from the electronic oral temperature reference standard. The

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