Temperature Measurements

Comparison of different thermometer types for patients with cancer

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BACKGROUND: Accurate temperature measurement in patients with cancer is critical. Many patients are neutropenic; therefore, fever represents an oncologic emergency, and, in many cases, it can be the only indication of a life-threatening infection. Although oral thermometers most closely represent true core temperature, patients may have barriers to oral thermometry.

OBJECTIVES: The purpose of this study was to assess the accuracy of two alternative, noninvasive thermometers (tympanic and temporal artery) by comparing them to an oral thermometer.

METHODS: A method-comparison study design was used. Each participant received three temperature measurements. The dependent variable was the difference in temperature between the test thermometers and the oral thermometer.

FINDINGS: The results suggest that neither of the test thermometers accurately represented core temperature, particularly in febrile patients. Both the tympanic and temporal artery thermometers became less accurate as oral temperature increased.

KEYWORDS
oral thermometer; tympanic; temporal artery; temperature; measurement

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TEMPERATURE MONITORING IS AN IMPORTANT MECHANISM for detecting fevers during treatment for cancer (Polovich, Olsen, & LeFebvre, 2014). Patients with cancer often experience neutropenia as a result of treatment, and fever may be the first sign of a potentially life-threatening infection, such as sepsis (Mason et al., 2015). For this reason, fever is considered an oncologic emergency, making accurate temperature measurement essential.

The most accurate measure of body temperature is core temperature, which can be measured with invasive devices, such as pulmonary artery catheters and bladder probes (Niven et al., 2015; Opersteny et al., 2017). Core temperature measures are common in critical care settings; however, in other areas, noninvasive alternatives are necessary (Kimberger, Cohen, Illievich, & Lenhardt, 2007). Nondisposable electronic oral thermometers are considered to most closely approximate core temperatures and are widely regarded as the gold standard of noninvasive temperature monitoring (Giuliano, Scott, Elliot, & Giuliano, 1999; Hooper & Andrews, 2006; Jefferies, Weatherall, Young, & Beasley, 2011; Mason et al., 2015; Niven et al., 2015; Smith, 2004; Wolfson, Granstrom, Pomarico, & Reimanis, 2013). However, oral thermometers pose potential problems in oncology settings and are typically avoided because of the risk for mucosal membrane bleeding during probe placement, pain associated with oral mucositis, and contraindications related to radiation or surgery to the head and neck (Bridges & Thomas, 2009; Gobel & O'Leary, 2007; Mason et al., 2015). Several alternative thermometers are available, including tympanic and temporal artery thermometers. Although a number of studies have compared the accuracy of these alternatives to the oral thermometer, substantial variability exists in the methodologies and patient populations that have been studied, making it difficult to draw firm conclusions (Bonzi, Fiorelli, Solbiati, & Montano, 2016; Bridges & Thomas, 2009; Niven et al., 2015). For example, many studies comparing noninvasive thermometers have been conducted with pediatric patients (Allergaert, Casteels, van Gorp, & Bogaert, 2014; Hebbar, Fortenberry, Rogers, Merritt, & Easley, 2005; Lee et al., 2011; Opersteny et al., 2017; Penning, van der Linden, Tibboel, & Evenhuis, 2011; Reynolds et al., 2014; Teran et al., 2012; Zhen et al., 2015), but anatomical differences in blood vessel position and in the types of thermometers that are compared