

CADTH Reference List

Infrared Temporal Thermometers

March 2023

Authors: Lindsay Ritchie, Andrea Ryce

Cite As: *Infrared temporal thermometers*. (CADTH reference list: summary of abstracts). Ottawa: CADTH; 2023 Mar.

Disclaimer: The information in this document is intended to help Canadian health care decision-makers, health care professionals, health systems leaders, and policy-makers make well-informed decisions and thereby improve the quality of health care services. While patients and others may access this document, the document is made available for informational purposes only and no representations or warranties are made with respect to its fitness for any particular purpose. The information in this document should not be used as a substitute for professional medical advice or as a substitute for the application of clinical judgment in respect of the care of a particular patient or other professional judgment in any decision-making process. The Canadian Agency for Drugs and Technologies in Health (CADTH) does not endorse any information, drugs, therapies, treatments, products, processes, or services.

While care has been taken to ensure that the information prepared by CADTH in this document is accurate, complete, and up to date as at the applicable date the material was first published by CADTH, CADTH does not make any guarantees to that effect. CADTH does not guarantee and is not responsible for the quality, currency, propriety, accuracy, or reasonableness of any statements, information, or conclusions contained in any third-party materials used in preparing this document. The views and opinions of third parties published in this document do not necessarily state or reflect those of CADTH.

CADTH is not responsible for any errors, omissions, injury, loss, or damage arising from or relating to the use (or misuse) of any information, statements, or conclusions contained in or implied by the contents of this document or any of the source materials.

This document may contain links to third-party websites. CADTH does not have control over the content of such sites. Use of third-party sites is governed by the third-party website owners' own terms and conditions set out for such sites. CADTH does not make any guarantee with respect to any information contained on such third-party sites and CADTH is not responsible for any injury, loss, or damage suffered as a result of using such third-party sites. CADTH has no responsibility for the collection, use, and disclosure of personal information by third-party sites.

Subject to the aforementioned limitations, the views expressed herein do not necessarily reflect the views of Health Canada, Canada's provincial or territorial governments, other CADTH funders, or any third-party supplier of information.

This document is prepared and intended for use in the context of the Canadian health care system. The use of this document outside of Canada is done so at the user's own risk.

This disclaimer and any questions or matters of any nature arising from or relating to the content or use (or misuse) of this document will be governed by and interpreted in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein, and all proceedings shall be subject to the exclusive jurisdiction of the courts of the Province of Ontario, Canada.

The copyright and other intellectual property rights in this document are owned by CADTH and its licensors. These rights are protected by the Canadian *Copyright Act* and other national and international laws and agreements. Users are permitted to make copies of this document for non-commercial purposes only, provided it is not modified when reproduced and appropriate credit is given to CADTH and its licensors.

About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

Funding: CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

Questions or requests for information about this report can be directed to requests@cadth.ca

Key Messages

- We found 1 non-randomized study about the diagnostic test accuracy of infrared temporal thermometers versus oral thermometers in people requiring thermometry.
- We did not find any studies on the clinical utility of infrared temporal thermometers versus oral thermometers in people requiring thermometry.
- We found 1 evidence-based guideline regarding the use of infrared temporal thermometers in people requiring thermometry.

Research Questions

1. What is the diagnostic test accuracy of infrared temporal thermometers versus oral thermometers in people requiring thermometry?
2. What is the clinical utility of infrared temporal thermometers versus oral thermometers in people requiring thermometry?
3. What are the evidence-based guidelines regarding the use of infrared temporal thermometers in people requiring thermometry?

Methods

Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE All via Ovid, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused Internet search. The search strategy comprised both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were temporal thermometers and oral thermometers. Search filters were applied to limit retrieval to guidelines. Where possible, retrieval was limited to humans. The search was also limited to English-language documents published between January 1, 2018, and February 8, 2023.

Selection Criteria and Summary Methods

One reviewer screened literature search results (titles and abstracts) and selected publications according to the inclusion criteria presented in [Table 1](#). Full texts of study publications were not reviewed. The Overall Summary of Findings was based on information available in the abstracts of selected publications. Open access full-text versions of evidence-based guidelines were reviewed when available, and relevant recommendations were summarized.

Table 1: Selection Criteria

Criteria	Description
Population	People requiring thermometry
Intervention	Infrared temporal thermometers
Comparator	Q1 and Q2: Oral thermometers Q3: Not applicable
Outcomes	Q1: Diagnostic test accuracy (e.g., sensitivity, specificity, positive predictive value, negative predictive value) Q2: Clinical utility (e.g., time to treatment, morbidity, mortality) Q3: Recommendations regarding the use of infrared temporal thermometers (e.g., appropriate distance for effective use)

Results

One non-randomized study was identified regarding the diagnostic test accuracy of infrared temporal thermometers versus oral thermometers in people requiring thermometry.¹ One evidence-based guideline was identified regarding the use of infrared temporal thermometers in people requiring thermometry.² No relevant literature was identified regarding the clinical utility of infrared temporal thermometers versus oral thermometers in people requiring thermometry. No relevant health technology assessments, systematic reviews, or randomized controlled trials were identified.

Additional references of potential interest that did not meet the inclusion criteria are provided in [Appendix 1](#).

Overall Summary of Findings

One non-randomized study was identified regarding the diagnostic test accuracy of infrared temporal thermometers versus oral thermometers in people requiring thermometry.¹ The non-randomized study concluded that, compared to an oral electronic thermometer, the temporal artery thermometer had the highest sensitivity and specificity of the various types of infrared thermometers tested.¹ The non-contact forehead thermometer showed low sensitivity to detect fever.¹ The authors advised caution when replacing oral thermometers with infrared thermometers.¹

One evidence-based guideline was identified regarding the use of infrared temporal thermometers in people requiring thermometry.² It recommended against the use of non-contact infrared thermometers in individual patients unless measurements, particularly those that are elevated, can be verified by a more reliable thermometer type.² This was classified as a strong recommendation with a low overall certainty of evidence.²

No relevant literature was found regarding the clinical utility of infrared temporal thermometers versus oral thermometers in people requiring thermometry; therefore, no summary can be provided.

References

Health Technology Assessments

No literature identified.

Systematic Reviews

No literature identified.

Randomized Controlled Trials

No literature identified.

Non-Randomized Studies

1. Ravi N, Vithyananthan M, Saidu A. Are all thermometers equal? A study of three infrared thermometers to detect fever in an African outpatient clinic. *PeerJ*. 2022;10:e13283. [PubMed](#)

Guidelines and Recommendations

2. Office of Evidence Based Practice (EBP). Critically appraised topic (CAT): non-contact infrared thermometers (NCIT). Kansas City (MO): Children's Mercy; 2020: <https://www.childrensmercy.org/siteassets/media-documents-for-depts-section/documents-for-health-care-providers/evidence-based-practice/critically-appraised-topics/infrared-thermometer.pdf>. Accessed 2023 Feb 13.
Refer to Recommendations Based on Current Literature (Best Evidence) Only on page 1

Appendix 1: References of Potential Interest

Previous CADTH Reports

Peprah K, Topfer LA. Infrared temperature devices for infectious disease screening during outbreaks: overview of an ECRI evidence assessment. (*CADTH technology review: focused critical appraisal no. 30*). Ottawa (ON): CADTH; 2020: <https://www.cadth.ca/sites/default/files/covid-19/ha0004-non-contact-ir-temperature-screening-final.pdf>. Accessed 2023 Feb 13.

Hafizi D, McCormack S. Infrared tympanic thermometers for measurement of temperature in adults and children: clinical effectiveness, diagnostic accuracy, and guidelines. (*CADTH rapid response report: summary of abstracts*). Ottawa (ON): CADTH; 2019: <https://www.cadth.ca/sites/default/files/pdf/htis/2019/RB1321%20Infrared%20Tympanic%20Thermometers%20Final.pdf>. Accessed 2023 Feb 10.

Young C, Arg ez C. Thermometer use for febrile pediatric patients: clinical effectiveness, accuracy, and guidelines. (*CADTH rapid response report: summary of abstracts*). Ottawa (ON): CADTH; 2018: <https://www.cadth.ca/sites/default/files/pdf/htis/2018/RB1183%20Thermometers%20for%20Pediatrics%20Final.pdf>. Accessed 2023 Feb 10.

Non-Randomized Studies

Alternative Population – Healthy Adults

Chen A, Zhu J, Lin Q, Liu W. A comparative study of forehead temperature and core body temperature under varying ambient temperature conditions. *Int J Environ Res Public Health*. 2022 11 29;19(23):29. [PubMed](#)

Alternative Intervention – Sublingual Use of Infrared Non-Contact Thermometer

Mahabala C, Dakappa PH, Gupta AR. A novel method for measuring sublingual temperature using conventional non-contact forehead thermometer. *F1000Res*. 2022;11:13. [PubMed](#)

Alternative Comparator

Kavthekar SO, Chougule AA, Kavthekar SS, Kurane AB, Verma S. Assessment of preferable site for temperature measurement using non contact infra-red temperature among pediatric patients. *Minerva Pediatr*. 2020 May 15. [PubMed](#)

Brosinski C, Valdez S, Riddell A, Riffenburgh RH. Comparison of temporal artery versus rectal temperature in emergency department patients who are unable to participate in oral temperature assessment. *J Emerg Nurs*. 2018 Jan;44(1):57-63. [PubMed](#)

Alternative Outcome – Agreement Between Thermometry Methods

Sweeting P, Murphy M, Geraghty S, Duddle M. Peripheral thermometry: agreement between non-touch infrared versus traditional modes in an adult population. *J Adv Nurs*. 2022 Feb;78(2):425-433. [PubMed](#)

Onubogu UC, Wonodi W, West BA. Comparison of temperature readings, infrared, non-contact thermometer with contact digital thermometer readings in children. *West Afr J Med*. 2021 09 30;38(9):851-858. [PubMed](#)

Blake S, Fries K, Higginbotham L, et al. Evaluation of noninvasive thermometers in an endoscopy setting. *Gastroenterol Nurs*. 2019 Mar/Apr;42(2):123-131. [PubMed](#)

Paik GJ, Henker H, Sereika S, et al. Accuracy of temporal artery thermometry as an indicator of core body temperature in patients receiving general anesthesia. *J Perianesth Nurs*. 2019 Apr;34(2):330-337. [PubMed](#)

Gates D, Horner V, Bradley L, Fogle Sheperd T, John O, Higgins M. Temperature measurements: comparison of different thermometer types for patients with cancer. *Clin J Oncol Nurs*. 2018 12 01;22(6):611-617. [PubMed](#)

Review Articles

Non-contact infrared thermometers: based on available evidence up to 4 August 2020. (*MaHTAS COVID-19 rapid evidence updates*). Putrajaya (Malaysia): Malaysian Health Technology Assessment Section (MaHTAS); 2020: https://covid-19.moh.gov.my/kajian-dan-penyelidikan/mahtas-covid-19-rapid-evidence-updates/08_NON-CONTACT_INFRA-RED_THERMOMETERS.pdf. Accessed 2023 Feb 10.

Ryan-Wenger NA, Sims MA, Patton RA, Williamson J. Selection of the most accurate thermometer devices for clinical practice: part 1: meta-analysis of the accuracy of non-core thermometer devices compared to core body temperature. *Pediatr Nurs*. 2018 May/Jun;44(3):116-133.

Additional References

Concise Research Report

Haimovich AD, Taylor RA, Krumholz HM, Venkatesh AK. Performance of temporal artery temperature measurement in ruling out fever: implications for COVID-19 screening. *J Gen Intern Med*. 2020;35(11):3398-3400. [PubMed](#)

Research Letter

Bhavani SV, Wiley Z, Verhoef PA, Coopersmith CM, Ofotokun I. Racial differences in detection of fever using temporal vs oral temperature measurements in hospitalized patients. *JAMA*. 2022 09 06;328(9):885-886. [PubMed](#)