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Thermometer Comparison

There are a wide variety of thermometers on the market to measure a patient's temperature. The table below describes the types of available thermometers, including general instructions for use, age ranges, and normal temperature values. Continue to the end of the document for important educational points about selecting and using thermometers.

Route/Type/Cost	General Instructions (may vary by brand)	Comments

Rectal
(digital probe thermometer)
 	
~$6 to $20[4]
	• Lubricate the thermometer tip with petroleum jelly.[1]
	• Lay child face down across lap or place child face up and bend their legs to their chest. Rest your free hand against the back of the child's thighs.[1]
	• Insert the thermometer ½ inch to 1 inch into the rectum.[1]
	• Hold the thermometer in place until it signals and temperature is displayed.[1]
	• Disinfect thermometers **before and after use** with soap or an alcohol swab.[5]
		• **Most accurate**; considered the standard to measure temperature.[3,6]
		• Patient has a fever if **rectal** temperature ≥100.4°F (38°C).[1]
		• Recommended route for:
		  • young children, especially infants <3 months of age.[1]
		  • for patients with neutropenia or when temperature will impact clinical decisions.[10]
		• Invasive; potential risk of rectal injury.[3]
		• Do not use the same digital thermometer for oral and rectal use. Patients should purchase two thermometers if they intend to use both routes and label each thermometer.[1]

Oral (digital probe thermometer) ~$6 to $20[4]	• Wait 15 to 30 minutes after drinking or eating before use.[1,3,5] • Place tip of the thermometer under the tongue.[1] • Close mouth/lips and breathe through the nose.[1] • Do not use teeth to hold the thermometer in place.[5] • Hold the thermometer in place until it signals and temperature is displayed.[1]	• Patient has a fever if **oral** temperature ≥100°F (37.8°C).[1] • Some patients (especially children) may find it uncomfortable to keep their mouth closed long enough for a reading (usually about one minute).[2] • For use in children four years or older.[5]
Underarm/Axillary (digital probe thermometer) ~$6 to $20[4]	• Place thermometer under clean and dry armpit.[1,3] • Thermometer must be touching skin, **not clothing**.[1] • Hold the thermometer in place until it signals (usually 30 seconds to one minute) and temperature is displayed.[1] • Do not use directly after vigorous activity or bathing.[3]	• Less accurate than rectal or oral routes. May be useful for screening.[1] • Patient has a fever if **axillary** temperature ≥99°F (37.2°C).[1] • Can be used in children three months and older.[1] • If a fever is detected, or there is doubt to the reading, confirm reading with another method.[1,3] • Accuracy can be affected by incorrect placement, movement during measurement, and inadequate duration of placement.[3]

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Route/Type/Cost	General Instructions (may vary by brand)	Comments
Ear (digital tympanic thermometer) ~$30 to $50[a]	• Wait 15 minutes after coming indoors on a cold day before use.[5] • Gently pull the child's ear **straight back** if under one year of age. Pull ear **up and back** if >1 year of age.[5] • Gently insert thermometer probe tip into the ear.[1] Do not use force or push hard. • Follow thermometer directions to ensure the tip is the right distance into the ear canal.[1] • Hold the thermometer in place until it signals and temperature is displayed.[1]	• Patient has a fever if **ear** temperature is ≥100.4°F (38°C).[1] • Uses infrared scanner to measure temperature.[1] **Safe to use**.[11] Does NOT emit radiation or infrared wavelengths into the body. These are sensors which pick up natural infrared wavelengths that the body emits.[12] • Noninvasive and takes only seconds for a reading. • Not recommended in infants <6 months.[1,5] • Excessive earwax, a small and/or curved ear canal, ear infections, or improper placement can affect accuracy.[1,3] • Can give a reading that is too low.[6] • If used correctly, may be more accurate than oral and axillary temperatures.[3]
Forehead (temporal artery thermometer) Available as touch and non-touch. Some devices can be used on alternate sites (e.g., wrist, behind the ear, naval, temple), but these sites may not be as accurate as the forehead.[3,11] ~$15 to $40[a]	• To improve accuracy, if moving the device from a hotter or colder area, allow the thermometer to adjust to room temperature for at least 30 minutes.[3,5] • Check instructions to see where and how close the thermometer must be to the skin.[5] • For contact devices, gently place flat on the forehead and lightly slide across (maintaining contact) per device directions.[1,3] • Not recommended for outdoor use on hot days, in direct sunlight, and/or if there is sweat on the skin.[14] • Temperature should not be measured over scar tissue, open wounds, or abrasions.[14] • To avoid inaccurate readings, wipe away sweat or dirt and move aside any hair or clothing (e.g., hat, scarf).[3,15]	• Patient has a fever if **forehead** temperature is ≥100.4°F (38°C).[1] • Uses infrared scanner to measure temperature.[1,2] **Safe to use**.[11] Does NOT emit radiation or infrared wavelengths into the body. These are sensors which pick up natural infrared wavelengths that the body emits.[12] • Noninvasive, fast, for all ages. Can be used when sleeping.[1-3,5,7] • **If used properly**, may be the most accurate alternative to a rectal thermometer.[2,3,8] However, prone to user error.[3,9] • Accuracy CAN be affected many factors (e.g., a dirty lens, improper positioning).[3,7] • Accuracy MIGHT be affected by sex, skin color, and other patient characteristics.[9] • Readings are NOT recommended to make clinical decisions.[9-11]
Oral (digital pacifier thermometer) ~$4 to $14[a]	• Wait 20 to 30 minutes after drinking or eating before use.[3] • Inspect for cracks or tears. Don't use if there are defects.[3] • The pacifier should be held in the mouth **without moving** for the instructed time (two to six minutes), until it signals and the temperature is displayed.[2,3]	• Not recommended (even in newborns), due to lack of accuracy data.[1,2] • Noninvasive. • Option for use in infants three months or older when an exact reading is less crucial.[3]

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Route/Type/Cost	General Instructions (may vary by brand)	Comments
Color changing strips (e.g., *NexTemp, Tempa DOT*) ~<$1 to $6[a]	• Press strip against forehead, under the arm, under the tongue, etc; depending on manufacturer's instructions. • Usually reads within one minute. • Clean reusable strips as directed.	• Not recommended, due to lack of accuracy and reliability.[1,3,5] • Detects changes in skin temperature, but not reliable to measure core body temperature.[3] • Available as reusable and single-use (usually more expensive). • May be helpful for a quick temperature screening.[5]
Wearable thermometer ~<$1 to $20[a]	• Follow instructions provided for placement of the sensor (e.g., patch/sticker, watch, sensor device).	• Not recommended, due to lack of data and reliability.[7] • Check device instructions, including age for use. • Some devices connect to smartphone apps to track temperature, provide alerts, etc. • Some are stick-on "fever indicators," which are placed on the forehead for up to 48 hours.[13] • Use an alternate thermometer to confirm readings.[13]

a. Approximate cost based on a sampling from online retailers.

Important Educational Points About Selecting and Using Thermometers

- When choosing a thermometer, consider the patient's age, ability to follow directions for use, accuracy, and cost.[1,2]
- Advise patients to always read the instructions that come with the thermometer and to clean the thermometer before and after each use.[2]
- To accurately monitor changes throughout an illness, patients should use the same thermometer and same site of measurement.[3]
- Explain to patients that temperature measurements have different normal values, based on the route used to measure.[1]

Users of this resource are cautioned to use their own professional judgment and consult any other necessary or appropriate sources prior to making clinical judgments based on the content of this document. Our editors have researched the information with input from experts, government agencies, and national organizations. Information and internet links in this article were current as of the date of publication.

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