

FUNDAMENTAL

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Barbara Kuhn Timby

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Barbara K. Timby, RN, BSN, MA

Professor Emeritus

Glen Oaks Community College

Centreville, Michigan

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*This edition of **Fundamental Nursing Skills and Concepts** is dedicated to all student nurses who will join the ranks of practicing nurses to meet the nation's present health care needs and those that arise in the future.*



Contributors

CONTRIBUTORS

Susan G. Dudek, RN, CDN, BS
Nursing Instructor
Dietetic Technology Program
Erie Community College
Williamsville, New York

Susan M. Ford, MN, RN, CNE
Adjunct Nursing Faculty
Bates Technical College
Tacoma, Washington

REVIEWERS

Amy Austin, MSN
Nursing Instructor
San Jacinto College
Houston, Texas

Janis Baker, BSN, RN
Director of VN Program
Valley Baptist Medical Center
Harlingen, Texas

LaVon Barret, MSN
Nursing Professor
Amarillo College
Amarillo, Texas

Peggy Betch, MSN, RN
Lead Instructor
Delaware Technical Community College
Dover, Delaware

Adrienne Blanks, LPN, RN, BSN, MSN
Associate Professor of Practical Nursing
Southside Virginia Community College
Alberta, Virginia

Patricia Clowers, RN, MSN
Director of Nursing and Allied Health
East Mississippi Community College
Scooba, Mississippi

Audria Denker, DNP, MSN, RN
Executive Vice President of Prelicensure Nursing
Galen College of Nursing
Louisville, Kentucky

LaTonya Dowell, MSN
Nursing Instructor
Tennessee College of Applied Technology
Memphis, Tennessee

Carol A. Miller, MSN, RN-BC, AHN-BC
Gerontological Clinical Nurse Specialist and Nurse Case Manager
Care and Counseling, Miller/Wetzler Associates
Clinical Faculty
Frances Payne Bolton School of Nursing
Case Western Reserve University
Cleveland, Ohio

Barbara K. Timby, RN, BSN, MA
Professor Emeritus
Glen Oaks Community College
Centreville, Michigan

Penny Fauber, RN, BSN, MS, PhD
Director of Practical Nursing Program
Dabney S. Lancaster Community College
Clifton Forge, Virginia

Gloria Gingrich, BSN
Nursing Instructor
Lebanon County Career and Technology Center
Lebanon, Pennsylvania

Erin Habs, BSN, RN
Lead Instructor
Valley Baptist School of Vocational Nursing
Harlingen, Texas

Marie Harper, RN, BSN, MSN
Nursing Professor
Florida State College
Jacksonville, Florida

Joy Harrison, MSN, BSN
Practical Nursing Division Chair and Instructor
Alabama Southern Community College
Thomasville, Alabama

Lorena Hines, MSN
Nursing Instructor
Shawnee Community College
Ullin, Illinois

Cynthia Hotaling, MSN, BSN, RN
Nursing Professor
Owens Community College
Toledo, Ohio

Lori Huber, MSN
LPN Coordinator
Portage Lakes Career Center
Uniontown, Ohio

Celeste Hughes, MSN, RN
Nursing Instructor
Georgia Northwestern Technical College
Rome, Georgia

Nora James, MSN, RN
VN Program Coordinator
Lee College
Baytown, Texas

Michelle Johnson, MSN
Professor, PN Coordinator
Northern Michigan University
Marquette, Michigan

Cynthia Leffel, MSN, RN-BC, PhD (c)
Associate Professor
Trocaire College
Buffalo, New York

Laura Mallett, MSN
Nursing Instructor
Neosho County Community College
Ottawa, Kansas

Lauren Mixon, BSN
Nursing Professor
Nunez Community College
Chalmette, Louisiana

Melaine Moore, PhD, MSN, RN
Assistant Dean of Nursing
VIRGINIA WESTERN Community College
Roanoke, Virginia

Patricia Needham, ASN
Nursing Instructor
Northshore Technical Community College-FPC
Kentwood, Louisiana

Karen Neighbors, MSN
Nursing Instructor
Trinity Valley Community College
Kaufman, Texas

Sharon Nowak, MSN, EdD (c)
Professor of Nursing
Jackson College
Jackson, Michigan

Cathy Onsager, MSN
Nursing Instructor
Galen College of Nursing
Louisville, Kentucky

Lisa Peak, MSN
PN Program Director
Galen College of Nursing
Louisville, Kentucky

Adrienne Reyes, BSN, RN
Nursing Instructor/Student Development
Valley Baptist Medical Center
Harlingen, Texas

Polly Reynolds, MSN
Nurse Educator
Galen College of Nursing
Louisville, Kentucky

Carolyn Santiago, MSN, RN, NP-C
Director of Nursing
Santa Barbara Business College
Bakersfield, California

Alnisa Shabazz, MS, RN
Assistant Professor
BRONX Community COLLEGE
New York, New York

Becky Shuttlesworth, BSN
Simulation Coordinator
San Jacinto College South
Houston, Texas

Evelyn Simmons
Nursing Instructor
Florida State University
Tallahassee, Florida

Deborah Smith, ASN
Nursing Instructor
Oconee Fall Line Technical College
Dublin, Georgia

Vernita Smith, MSN, BSN, RN
Nursing Instructor
Fortis College-Cincinnati
Cincinnati, Ohio

Deborah Stewart
Nursing Faculty
Cabell County Career Technology Center
Huntington, West Virginia

Lynne Sullivan, MS
Nursing Coordinator
Bristol Plymouth Regional Technical School
Taunton, Massachusetts

Teresa Truckenbrod, BSN, MS, RN
Nursing Faculty
Anoka Technical College
Anoka, Minnesota

Renee Zacher, BSN, RN
Nursing Faculty
Western Dakota Tech
Rapid City, South Dakota

thermometer can result in inaccurate measurements, deviating by as much as 1.5°F (0.9°C) from the actual temperature.

The oral site is contraindicated for clients who are uncooperative, very young, unconscious, shivering, prone to seizures, or mouth breathers; those who have had oral surgery; and those who continue to talk during temperature assessment. To ensure accuracy, the nurse delays the oral temperature assessment for at least 30 minutes after the client has been chewing gum, smoking a cigarette, or eating hot or cold food or beverages.

Rectal Site

A rectal temperature differs only about 0.2°F (0.1°C) from the core temperature. It provides the best measurement for children less than 3 years of age, but care must be taken to avoid injuring a young child who is not cooperative. Rapid fluctuations in temperature may not be identified for as long as 1 hour, however, because this area retains heat longer than other sites. In addition, this site can be embarrassing and emotionally traumatic for alert clients. Furthermore, stool in the rectum, improper placement of the thermometer, and premature removal affect the accuracy of rectal temperature assessment.

Axillary Site

The axilla, or underarm, is an alternative site for assessing body temperature. Temperature measurements from this site are generally 1°F (0.6°C) lower than those obtained at the oral site and reflect shell rather than core temperature (except in newborns). Because infants can be injured internally with rectal thermometers and because they lose heat through their skin at a greater rate than other age groups, the axilla and the groin, areas where there is skin-to-skin contact, have

traditionally been the preferred sites for temperature assessment in this age group.

The axillary site has several advantages for all age groups. It is readily accessible in most instances. It is safe. There is less potential for spreading microorganisms than with the oral and rectal sites, and it is less disturbing psychologically than the rectal site. This route, however, requires the longest assessment time of 5 minutes or longer depending on the electronic monitoring mode being used (discussed later). Poor circulation, recent bathing, or rubbing the axillary area dry with a towel also affects the accuracy of the axillary site.

Thermometers

There are several types of **clinical thermometers** (instruments used to measure body temperature): electronic, infrared, chemical, digital, and glass (Table 12-3).

Electronic Thermometers

An electronic thermometer (Fig. 12-4) uses a temperature-sensitive probe covered with a disposable sheath attached by a coiled wire to a display unit. Electronic thermometers are portable. They are recharged when not in use.

Electronic thermometers generally have two types of probes: one for oral or axillary use and the other for rectal use. Some models offer the option of providing the measurement in Fahrenheit or centigrade.

Electronic thermometers operate in either a *predictive mode* or a *monitor mode*. If used in the predictive mode, the thermometer takes multiple measurements that a computer chip processes in only a few seconds to determine what the temperature would be if the thermometer was left in place

TABLE 12-3 Types of Clinical Thermometers

TYPE	ADVANTAGES	DISADVANTAGES
Electronic	Faster than glass Accurate No sterilization or disinfection needed Easy to use	Expensive Recharging is necessary. Probe needs to be held by the client or nurse. Interference with simultaneously taking the client's pulse while holding the probe with one hand and unit in the other
Infrared (tympanic)	Fast Convenient Close approximation of core temperature Less invasive Accuracy unaffected by eating, drinking, or breathing Sanitary	Expensive in comparison with others Battery recharging is necessary. Accuracy is affected by improper placement and probe size. Actual ear and core temperature ranges are slightly different from oral, rectal, and axillary sites. Tip requires cleaning with a paper tissue or alcohol swab. Extreme hot or cold environmental temperatures may affect electronics. No sterilization or disinfection is required. User error if the thermometer is moved too quickly across the skin Hair, clothing, or bandages between the probe and the skin can result in falsely high readings. Infrared probe requires cleaning between uses with an alcohol prep pad and dry swab.
Infrared (temporal artery)	Closest approximate of core temperature Most sanitary Most convenient for clients Records within 2 seconds Initial cost is similar to other types of electronic and tympanic membrane thermometers. Probe covers are not needed; decreases volume of disposal waste Can be used over the femoral artery or lateral thoracic artery if the temporal artery is inaccessible due to bandaging or trauma	

(continued)



FIGURE 12-5 An infrared tympanic thermometer. (Copyright B. Proud.)

alters the location where infrared light must be precisely directed. Consequently, use of a tympanic thermometer is contraindicated for children younger than 2 years.

- The sensor is directed at the ear canal rather than directly at the tympanic membrane.
- There is impacted **cerumen** (ear wax), a common problem among older adults.
- There is fluid behind the tympanic membrane, a problem that occurs with middle-ear infections.
- The **drawdown effect** (cooling of the ear when it comes in contact with the probe) occurs.

The first use of a tympanic thermometer after recharging is not always as accurate as a second reading. Another criticism of the tympanic temperature measurement is that currently there is no standard for actual ear or core temperatures. At present, tympanic thermometers use internally calculated **offsets** (predictive mathematical conversions) for oral and rectal temperatures. These offsets vary among manufacturers.

Infrared Temporal Artery Thermometer

The temporal artery thermometer (Fig. 12-6) contains an infrared sensor that uses computerized algorithms to compute temperature measurements. It does so by calculating the difference between the heat radiating from the temporal artery at the center of the forehead and the heat loss at the skin. Because there may be evaporative cooling on the exposed skin on the forehead, *the thermometer is secondarily moved to scan the skin behind the ear lobe*, which tends to remain relatively dry (Nursing Guidelines 12-1). An assessment over the temporal artery in the forehead alone is sufficient for infants.

Glass Thermometers

Electronic and infrared tympanic thermometers have replaced glass mercury thermometers in health care agencies. Glass thermometers contain mercury and are considered environmentally toxic and obsolete because safer alternatives are available and preferred. The Mercury Reduction



FIGURE 12-6 A temporal artery thermometer. (Photo by K.Timby)

Act, passed in 2002 and amended in 2005 and 2012, prohibits the sale or supply of mercury fever thermometers to consumers, except by prescription. It further requires manufacturers to provide clear instructions on handling mercury thermometers to avoid breakage and proper cleanup in the event of a breakage (United States 107th Congress, 2002; United States 109th Congress, 2005; United States 112th Congress, 2012). Health care institutions are making their facilities mercury free.

Nurses may be required to use a client's glass thermometer or to teach a client to use one because that is all the client has available. If a glass thermometer is the only option, the nurse teaches clients and their family members how to clean the glass thermometer (see Client and Family Teaching 12-1).

If a glass thermometer breaks, the mercury is disposed of following the actions discussed in Nursing Guidelines 12-2.



NURSING GUIDELINES 12-1

Using a Temporal Artery Thermometer

- Perform hand hygiene.
- Place the probe at the center of the forehead (Fig. A).
- Depress the sensing button on the thermometer throughout the procedure.
- Slide the thermometer laterally across the forehead to the hairline (Fig. B).
- Lift the probe while keeping the button depressed.
- Relocate the probe behind the ear.
- Slide the probe to the depression behind the ear lobe (Fig. C).
- Release the button.
- Read and record the displayed temperature.
- Wait 30 seconds if a sequential measurement is needed or use the opposite side.
- Clean the thermometer probe with an alcohol pad and a dry swab.
- Replace the 9 V alkaline battery when “BATT” display indicates the battery is low.

