THEORY AND PRACTICE

7E

Gabrielle Koutoukidis
MPH, BN(Mid), DipAppSci(Nurs), AdvDipN(Ed), DipBus,
Voc Grad Cert Business (Transformational Management), MACN,
International Specialised Skills Institute Fellow, Candidate EdD(Research)
Associate Director, Health & Community Care, Chisholm Institute, Melbourne, Victoria

Kate Stainton
MA HlthSc(Nurs), GDipNurs(Ed), BN(Mid), DipAppSci(Nurs), Cert IV TAE
Teacher, Ageing, Disabilities & Nursing, TAFE NSW Hunter Institute;
RN/RM, Newcastle Private Hospital, Newcastle, New South Wales

Jodie Hughson
MPH, GCHP Cert IV TAE, RN
Quality and Risk Manager, Healthcare Australia, Woolloongabba, Queensland

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Contributors

Louise Alexander  MEd, BN, RN, GCMHN, GCPET, PhD Candidate
Lecturer, Mental Health Nursing, School of Nursing, Midwifery & Paramedicine, St Patrick’s Campus, Australian Catholic University, Melbourne, Victoria, Australia

Christine Baker  MNst, GDipEd & VocEdn, BAAppSc(Nsg), DipVETPrac
Project Manager, Department of Nursing, Chisholm Institute, Melbourne, Victoria, Australia

Lindsay Bava  MEd, BHealth(Nur), GDipIndEd, Cert IV TESOL, Cert IV TAE, DipVET
Head of School, Nursing, Head of School, Health Skills Australia, Queensland and Victoria, Australia

Leisa Bishop  GCICN, BN, DipVET, Cert IV TAE
Cardiothoracics/Intensive Care Unit Clinical Nurse Consultant, Newcastle Private Hospital, Healthscope, Newcastle, New South Wales, Australia

Kerrie Coleman  MN Clinical(Wound), MNP (Chronic disease), BNSc, DipAppSc, PhD candidate
Nurse Practitioner Complex Wound Management, Skin Integrity Services, Royal Brisbane & Women’s Hospital, Herston, Queensland, Australia

Leigh Darcy  DipAppSc(Nurs), Grad Cert (Oncology and Management)
Special Projects Manager, Hunter Primary Care, Newcastle, New South Wales, Australia

Vivienne Therese Decleva  DEd, MNSt, BAppSc(Adv Nur), DipAppSc(CommHlthNsg), RN, MRN
Unit Coordinator, Department of Nursing, Paramedicine, Health Foundations, Victoria Polytechnic, St Albans, Victoria, Australia

Vicki Blair Drury  PhD, MClNur, PGCertPsychNur, BEd(TAE), BHealth(Nsg), Cert Men’s Health, OphthalmicNur, RN, RMHN
Independent Scholar, Educare Consulting, Bunbury, Western Australia, Australia

John P Elias  PhD, BSc(Hons) GCTT (Grad Cert Tertiary Teaching)
Lecturer, Human Bioscience, Department of Nursing, Holmesglen Institute, Melbourne, Victoria, Australia

Katie Frankiewicz  BN, RN, GCPN, Cert IV TAE
Registered Nurse, Operating Theatres, Gosford Private Hospital, Gosford, New South Wales, Australia

Andree Gamble  BN, RN, PGDACN (Child Health), GCPE, PGC PET, GCCS, DipBus, Cert IV TAA, MSN
Lecturer, Nursing, Holmesglen, Moorabbin, Victoria, Australia

Maree Gault  BEd, BN Cert IV TAE
Teacher and Course Coordinator, Diploma of Nursing, Holmesglen Institute, Melbourne, Victoria, Australia

Rachel Gilder  BN, DipTAE, DipTDD
Diploma of Nursing, Department of Nursing, Holmesglen, Melbourne, Victoria, Australia

Kelly Gray  MN(Ed), BN, GCEN, Cert IV TAE
Teacher, Diploma of Nursing, Faculty of Health Science, Youth & Community Studies, Holmesglen, Victoria, Australia

Michelle Hall  MA HealthProfEd, BN, Cert IV TAE
Program Manager, Diploma of Nursing, Department of Nursing, Holmesglen Institute, Melbourne, Victoria, Australia

Jodie Hughson  MPH, GCPE, Cert IV TAE, RN
Quality and Risk Manager, Healthcare Australia, Woolloongabba, Queensland, Australia

Lynelle Jenkinson  MN(AdPrac), BN
Clinical Nurse Specialist, John Hunter Hospital Emergency Department;
Teacher, Hunter TAFE, Newcastle, New South Wales, Australia

Jennifer Jennings  MHlthProfEd, GDipCritCare (ADD), BN, RN (GCClinSim)
Lecturer and Academic Lead, Simulation Education, Holmesglen, Moorabbin, Victoria, Australia
Yangama Jokwiro  MSc(Physiology), MPH, BSc(NursSc)
  Lecturer, School of Nursing and Midwifery, Latrobe
  University, Melbourne, Victoria, Australia

Susan Jones  MN, BN, DipCritCare, CNRN (Certified
  Neuroscience Registered Nurse)
  Clinical Educator, TAFE Queensland; Registered Nurse,
  ICU Gold Coast University Hospital, Gold Coast,
  Queensland, Australia

Gabrielle Koutoukidis  MPH, BN(Mid),
  DipAppSc(Nurs), AdvDipN, DipBus, Voc Grad Cert
  Business (Transformational Management), MACN,
  International Specialised Skills Institute Fellow, Candidate
  EdD (Research)
  Associate Director, Health & Community Care, Chisholm
  Institute, Melbourne, Victoria, Australia

Teresa Lewis  RN, CertICU and Infection Control
  Infection Prevention and Control Clinical Nurse
  Consultant, Newcastle Endoscopy Centre, Newcastle,
  New South Wales, Australia

Anne MacLeod  ME(Adult), GC(Flexible Learning &
  Simulation for Health Professionals), GCEd(Adult),
  GDipEd(Adult), BN, DipAppSc(Nurs), DipVocEd
  CertNeuro, CertAcCare
  Teacher, Aged Care, Disability & Nursing, Hunter TAFE,
  Newcastle;
  Nurse Educator, Toronto Private Hospital, Toronto, New
  South Wales, Australia

Auxilia E Madhuvu  MN, PGCCritCare, DipVET,
  Dip Training Design & Development, RN
  BN Lecturer, Nursing, Holmesglen Institute, Melbourne,
  Victoria, Australia

Jennifer Marshall  MMH, PGCPsychN, Cert IV TAE,
  RN
  Practice Development Consultant—Aged Care, Quality
  Learning and Workforce Development, Anglicare Southern
  Queensland, Brisbane, Queensland, Australia

Gillianne Meek  MN, BSc(Hons), RN
  Nurse/Midwife Recruiter, Bay of Plenty District Health
  Board, Tauranga, New Zealand

Sally Moyle  MClinNursTeach, BN
  Clinical Nurse Specialist, Rehabilitation, Epworth
  Health Care
  Clinical Educator, Health Skills Australia, Melbourne,
  Victoria, Australia

Goetz Ottmann  PhD, BA (Hons)
  School of Health and Social Development, Deakin
  University, Burwood, Victoria, Australia

Kylie Porritt  PhD MNSc, BN, GradDipClinNurs(Cardiac)
  Research Fellow, The Joanna Briggs Institute, The
  University of Adelaide, Adelaide, South Australia, Australia

Kalpana Raghunathan  MN(Education), MHRM,
  Masters (Development Studies), GDipDevStd,
  BA(Sociology), BN, DipBusMan, DipCommDev, Cert IV
  TAE, MACN
  Director/Principal Consultant, Education Strategy &
  Development, Caramar Educational Design, Melbourne,
  Victoria, Australia

Heather Redmond  MN, GCHighDepNur, GCCritCare,
  BN, BN(Hons), DipVET
  Critical Care Nurse, Latrobe Regional Hospital, Traralgon,
  Victoria, Australia

Robert M Ribbons  MEd(Computing), BAppSc(Nur),
  ICCert, RN
  Undergraduate Coordinator Bachelor of Nursing, Health
  Science and Biotechnology, Holmesglen, Moorabbin,
  Victoria, Australia

Jean Elizabeth Ross  BHSc, RN, RM, GCertMgt,
  GDipEd
  Head Teacher Aged Care, Disability & Nursing, Hunter
  TAFE, Newcastle, New South Wales, Australia

Lesley Seaton  PhD, MN, BN
  Senior Lecturer, International Relations Coordinator,
  Sydney Nursing School, The University Of Sydney, Sydney,
  New South Wales, Australia

Juanita Sherwood  PhD, RN, DipT(Primary),
  PGCertCollabRes
  Professor, Academic Director, National Centre for Cultural
  Competence, University of Sydney, Sydney, New South
  Wales;
  Adjunct Professor of Indigenous Health, Public Health,
  James Cook University, Townsville, Queensland, Australia

Kate Stainton  MA HlthSc(Nurs), GDipNurs(Ed),
  BN(Mid), DipAppSc(Nurs), Cert IV TAE
  Teacher, Ageing, Disabilities & Nursing, TAFE NSW
  Hunter Institute;
  RN/RM, Newcastle Private Hospital, Newcastle,
  New South Wales

Karen Stilo  BN
  Nurse, Holmesglen, Moorabbin, Victoria, Australia

Kym Louise Strachan  MPH, BN, DipHlthProm,
  DipPM
  Nursing Teacher, TAFE Queensland, Brisbane, Queensland,
  Australia
Lyn Talbot DrPH, MHlthSc, GDipHlthSc, GCHEd, RN
Corporate and Community Planner, City of Greater Bendigo;
Honorary Associate, School of Rural Health, La Trobe University, Bendigo, Victoria, Australia

Melissa Taylor MHlthSc, GDipHlthProm, BN, PhD Candidate
Senior Lecturer, School of Nursing and Midwifery, University of Southern Queensland, Ipswich, Queensland, Australia

Glenda Verrinder PhD, MHlthSc, GDipHlthSc, GCHEd, Cert CHN, RN, Midwife
Senior Lecturer, La Trobe Rural Health School, La Trobe University, Bendigo, Victoria, Australia

Nurse Teacher, Health and Community Services, Box Hill Institute, Moorabbin, Victoria, Australia

Margaret Webb MEd(AWE), GDipFET, GC, AdvDipBusMan, RN, RN, TESOL
Director/Consultant, Education and Training, MW Projects Queensland, Brisbane, Queensland, Australia

Yvonne Elizabeth Wilkinson MPH, BAppSc(Nur), DipAppScNurEd, RN

Denise Wilson PhD, MA(Hons), BA
Professor Māori Health, School of Public Health & Psychosocial Studies; Director, Taupua Waiora Māori Health Research Centre, AUT University, Auckland, New Zealand
Terri-Jayne Bissell  MN (Advanced Clinical Education), BHlthSc, Cert (Critical Care), Cert (High Dependency Nursing), TAA, RN
Sessional Academic, School of Nursing, Queensland University of Technology, Kelvin Grove, Queensland, Australia

Barbara Black  BN, GCPN, Masters Advanced Practice, Cert IV TAA, RN

Ann Bolton  MCN (Child & Family Health), BN, GDipAdNurs(Management), GDipMid, GrDipVET, BN, GCCritCare, Cert IV TAE, RN
Lecturer/Team Leader Nursing, School of Health, Charles Darwin University, Melbourne, Victoria, Australia

Dianne Cheeseman  GDipEd(Nur), BN, DipBT & TM, RCHN, RN, MACN
Nurse Education Consultant and Tutor, Brisbane, Queensland, Australia

Nicole Dillon  GCFLS, BN, DipAppSc(Nur), TAE Cert IV Training and Assessment, Well Women’s Health, Nurse Immuniser, RN
Casual Teacher TAFE NSW—Illawarra and North Sydney Institute; Casual Tutor, University of Western Sydney; Casual Tutor, Australian College of Nursing Member, NSW Nurses Association

Ellie Kirov  PhD, BSc(Hons)
Course Coordinator and Lecturer (Health Studies), Perth Institute of Business and Technology (PIBT), Perth; Research Fellow, Systems and Intervention Research Centre for Health (SIRCH), Edith Cowan University; Academic Instructor (UniPrep), Centre for Learning and Teaching, Edith Cowan University, Perth, Western Australia, Australia

Karen Mace  MN, GDipPsych, GDipFET(Ed), BN, DipProfCounselling, RN
Principal, HP Consulting and Counselling; RN/Therapist, Calvary Clinic, Calvary Health Care, Tasmania, Australia
Counsellor, Newstead Christian School Member, Australian Counselling Association

Katya May  PhD(Public Health), MSci(Nur), BA
Educator, Careers Australia, Brisbane, Queensland, Australia

Anoni Morse  GDipNur, BA, Paed Cert, AMH Cert, RN
Education Manager, Health, Aged and Disability Services North West, TasTAFE, Tasmania, Australia
Member, Australian Nursing and Midwifery Federation

Katie Piper  MN, PGCHPE, RN
Associate Lecturer, Nursing, Monash University, Melbourne, Victoria, Australia
CENA member

Stephanie Thompson  RN, DipMn, Intensive Care Adult and Paediatric Nursing Certificates
Content Writer, Gold Coast TAFE, Gold Coast, Queensland, Australia

Gayle Watson  MEdStud, BN(Hons); Cert IV TAE, RN
Lecturer (Advanced Skills Lecturer), Central Institute of Technology, Perth, Western Australia, Australia
Congratulations on choosing a rewarding and fulfilling career path.

The authors Gabrielle Koutoukidis, Kate Stainton and Jodie Hughson along with a team of worthy contributors have developed an essential learning resource for the Diploma of Nursing student in this the seventh edition of *Tabbner’s Nursing Care: Theory and Practice*.

As you work from the fundamentals of nursing onto psychosocial and physiological nursing care you will be rewarded with the wealth of knowledge that fills the pages of this book. This book will not only contribute significantly to you as a learning tool but will remain a valuable resource to refer to as your career progresses.

*Tabbner’s Nursing Care* is a user-friendly resource and the content throughout highlights developmental considerations, cultural aspects of care, current research and health education. All of the features will assist students in reflecting on their new-found knowledge and gaining a critical-thinking outlook. The comprehensive examples of Nursing Care Plans and Progress Notes throughout assist you in producing concise and accurate documentation while on placement and into your nursing career. There are examples of how to use the decision-making framework to best manage and develop your scope of practice and there is nothing more valuable in nursing than Lived Experiences—these experiences will become your most valuable developmental tools.

Enrolled Nurses have always been valuable members of the nursing team, giving hands-on care to individuals and their families/carers and being advocates for that care. As Enrolled Nurses become more involved in the multidisciplinary team they need increased IT skills, auditing (collecting and collating data) skills and quality and safety processing skills. Chapters on nursing informatics and technology in healthcare along with quality and safety in healthcare have been an important inclusion in the seventh edition of *Tabbner’s Nursing Care*.

As an Enrolled Nurse you will never stop learning and developing new skills. Even when your formal education is complete I would encourage you to embrace all opportunities to learn, within your scope of practice.

Always remember: evidence-based practice underpins best practice.

**Louise Dearman**

*President*

*National Enrolled Nurse Association (NENA)*
Alice Ray Tabbner
25 December 1919–13 December 1994

Ray (as she preferred to be known) Tabbner was born in Birmingham, England. After working in the St John Ambulance in World War II where she said she ‘became engrossed in nursing’, she completed her training as a nurse in the 1940s. She moved to Australia in 1948 and worked in a number of Sydney hospitals before settling in Melbourne.

Ray established a career in nursing education in 1953 taking on the role of Tutor at the recently established Melbourne School of Nursing. In 1954 she successfully completed her Sister Tutors Diploma through the College of Nursing Australia and remained a Tutor at the school until 1961 when she was awarded the Inaugural Nurse Scholarship in Geriatrics from Mount Royal Hospital. As a consequence of receiving this award, Ray was appointed to the position of Deputy Matron of Geriatric Nursing at Mount Royal. She later established the Nursing Aides course at the Fairfield Hospital in Melbourne under the leadership of Vivian Bulwinkel, and in 1973 was appointed Deputy Director Nursing (Education), one of three executive positions at the Royal Melbourne Hospital.

An innovative educator and mentor, Ray Tabbner was one of the first nurses to call for the establishment of ‘Nurse Banks’ in Australia to ensure flexibility in the nursing workforce for those nurses wishing to pursue family or other interests while pursuing their chosen profession. She was also a great advocate of ongoing training to ensure nurses could maintain flexibility in their lives and return to nursing with confidence.

In 1975 she was appointed Principal Teacher at the Melbourne Nursing Aides School (later renamed Melbourne School for Enrolled Nurses), a position she occupied until 1978 when she retired to write. Originally titled The Handbook for Nursing Aides, this book was later renamed Nursing Care: Theory & Practice and since the publication of the first edition in 1981, it has become known and loved by generations of nursing students as simply Tabbner’s.

An article published in 1973 in the Melbourne Sun described her as being ‘as flighty as your average banker. Her dark hair has streaks of steel grey and the creases in her dazzlingly white nurse’s uniform would slice bread’. However, students from the 1950s to the 1970s remember her with great fondness and warmth. Ray Tabbner was said to be very approachable and a welcome relief from many ‘military style’ nurse educators. She taught everything from anatomy and physiology to bandaging and nursing care and made a great impression on her students. As one student from 1955 put it, ‘Everything Miss Tabbner said, I learned’.

The Tabbner name has become synonymous with Enrolled Nurse/Registered Nurse Division 2 education not only throughout Australia—the influence of her name extends via this publication to New Zealand, the United Kingdom, the Middle East, Africa and the West Indies.

This seventh edition of Tabbner’s Nursing Care is dedicated to her memory and her contribution to nurse education.
The seventh edition of *Tabbner’s Nursing Care* is a significant revision which reflects the scope of practice in contemporary enrolled nursing practice while still retaining the strengths of previous editions that have made it an essential resource for enrolled nursing students and their facilitators.

**The role of the Enrolled Nurse**

The Enrolled Nurse is an essential member of the healthcare team, providing person-centred nursing care which includes recognising what is normal and abnormal in assessing, intervening and evaluating individual health and functional status. Enrolled Nurses’ responsibilities also include providing support and comfort, assisting with activities of daily living to enable individuals to achieve their optimal level of independence and providing for the emotional needs of people. Where state and territory law and organisational policies allow, Enrolled Nurses may administer prescribed medicines or maintain intravenous fluids, in accordance with their educational preparation.

Enrolled Nurses are required to be information-technology literate, with specific skills in the application of healthcare technology. Enrolled Nurses demonstrate critical- and reflective-thinking skills in contributing to decision making, including reporting changes in health and functional status and individual responses to healthcare interventions. Enrolled Nurses work as part of the healthcare team to advocate for and facilitate the involvement of individuals, their families and significant others in planning and evaluating care and progress towards health outcomes. The role also requires them to act as preceptors for students and other healthcare workers.

Career opportunities for Enrolled Nurses are expanding and include acute care; perioperative; emergency, intensive and coronary care; aged care; rehabilitation; community and mental health nursing; and general practice settings. In addition, Enrolled Nurses work in specialty areas such as nursing education, diabetes education, continence management, dementia management, lactation consultancy, workplace safety and wound care. There are also increasing opportunities for Enrolled Nurses to move into management positions.

**Seventh edition of *Tabbner’s Nursing Care***

Holistic, person-centred care is the approach used throughout the textbook, allowing students to appreciate the skill and scope required to be a safe and competent Enrolled Nurse. All chapters have been completely revised with a focus on critical thinking and problem solving, quality and safety and evidence-based practice, with national registration requirements addressed where appropriate.

Two new chapters have been included to highlight contemporary nursing issues:

- Nursing Informatics and technology in healthcare
- Quality and safety in healthcare

The full-colour internal design enhances photos and illustrations to provide clear and meaningful visual aids to learning.

The seventh edition has been carefully developed to align with the Diploma of Nursing in the HLT Health Training Package for the enrolled nursing student. It provides a contemporary approach to nursing practice and is an invaluable teaching resource. The text provides the theoretical knowledge on the care that individuals may require in a range of healthcare settings and offers special features to enhance student learning of the material.

This edition is a culmination of the efforts of many nursing academics and professionals who are passionate about the education of Enrolled Nurses and the important role they play in healthcare settings. We are grateful for their enthusiasm and support throughout the writing process. In addition, we would like to thank the team at Elsevier for their hard work and perseverance in ensuring the publication of this edition.

*Gabby Koutoukidis*
*Kate Stainton*
*Jodie Hughson*
Vital sign assessment

Rachel Gilder

LEARNING OUTCOMES

At the completion of this chapter and with further reading, students should be able to:

• Define the key terms
• Describe factors that affect the vital signs
• Identify the variations in acceptable ranges for body temperature, pulse, respirations and blood pressure that occur from infancy to older adulthood
• Describe advantages and disadvantages of using each body temperature site
• Verbalise the factors involved in the maintenance of the pulse and blood pressure
• Identify the sites commonly used to assess the pulse and state the reasons for their use
• State the factors necessary for an adequate supply of oxygen to the cells
• Identify the characteristics that should be included in a respiratory assessment
• Describe the various methods and sites to measure blood pressure
• Describe the importance of accurate and timely vital sign assessment in recognising a deteriorating individual
LIVED EXPERIENCE

The last time I was admitted into hospital I had a young student nurse look after me. The student was very meticulous and looked after all my needs. The only time that I felt uncomfortable and a little scared was the first time he took all my vital signs. He pumped up the cuff to take my blood pressure, with an intense look on his face, and deflated it. He then proceeded to do this three times. He then took my pulse and temperature and then, without telling me what was wrong, left the room with a panicked look on his face, telling me that he would have to go and get his teacher. I was so worried, I thought there was something wrong with me and that I wouldn't be able to go home. As I sat there waiting, thinking the worst, the student came back with the teacher and it turned out that he had placed the stethoscope the wrong way in his ears so he was unable to hear anything for my blood pressure and all my other observations were good. 

Bill, age 70

NURSING CARE PLAN 20.1

Assessment: Nicholas Peters, a 63-year-old man, has low blood pressure (101/59) and feels dizzy when ambulating.

Issue/s to be addressed: Low blood pressure

Feeling dizzy when ambulating

Goal/s: Monitor blood pressure

Increase blood pressure

Maintain safety and reduce dizzy feeling when ambulating

Care/Actions | Rationale
--- | ---
Monitor individual's blood pressure 2/24 and report changes appropriately. | To evaluate other care actions and monitor the individual's blood pressure.
Monitor individual’s blood pressure before ambulating. | To maintain safety of the individual and prevent patient harm.
Educate the person to ensure there is a nurse present when ambulating. | To maintain safety of the individual and prevent patient harm.
Encourage oral fluid intake. | To avoid dehydration, increase circulating volume and increase blood pressure.

Evaluation

The individual’s safety was maintained through frequency of monitoring and ensuring nurse presence when ambulating.
CLINICAL INTEREST BOX 20.1
Measuring temperature in older adults

- As neurological feedback and response in an older person have become slower the temperature of older adults is at the lower end of normal temperature range: 36°C (Grainger 2013)
- Temperatures considered within acceptable range may reflect a fever in an older adult
- Older adults are sensitive to slight changes in temperature

An electronic thermometer enables an accurate temperature reading to be obtained within a few seconds and may also be used when it is necessary to monitor an individual’s temperature continuously.

Body temperature sites

Body temperature may be measured using the oral, tympanic membrane or axillary sites. The taking of rectal temperature with a rectal thermometer is rarely performed because of the trauma and pain it causes individuals and because of the risk of cross-contamination. Even though some consider rectal temperature assessment as the gold standard for core temperature analysis in neonates, it is no longer performed (El-Radhi 2014).

Tympanic site

The tympanic membrane is now the most commonly used site for measuring temperature. An otoscope-like speculum with an infrared sensor tip detects heat radiated from the tympanic membrane. Within 2–5 seconds of placement in the auditory canal, a reading appears on the display unit (Figure 20.2). The advantages of using this site are that it is easily accessible and minimally invasive; minimal individual repositioning is required; the reading is unaffected by oral intake of food, fluids or smoking; and it can be used with individuals with tachypnoea without affecting breathing. Due to its position situated near the hypothalamus it has also been reported to detect rapid fluctuations in the core temperature (McCallum & Higgins 2012). Disadvantages of using this site are that it can be uncomfortable and it involves the risk of injuring the tympanic membrane if the probe is inserted too far, the presence of cerumen (wax) and purulent discharge can affect the reading and it requires removal of a hearing aid before measurement (McCallum & Higgins 2012). It is imperative to check the manufacturer’s guidelines for use of this device, as operator error and poor technique can alter accuracy and reliability.

The oral site

The thermometer is placed under the person’s tongue, close to the sublingual artery in the sublingual pocket, and the person closes their lips. This ensures changes in core temperature can be monitored (McCallum & Higgins 2012). The advantages of this site are that it is easily accessible, comfortable for the individual, reflects rapid change in core temperature and provides accurate surface temperature reading. Some factors that affect accuracy of this site are recent ingestion of hot/cold fluids or foods, and recent smoking or receiving oxygen by mask or nasal cannula (McCallum & Higgins 2012). Care must also be taken when an individual has dentures as it may be difficult for the individual to keep their mouth closed for the measurement. To obtain an accurate temperature measurement, the person must be:
- Able to close their lips completely and retain the thermometer in the correct position
- Able to breathe comfortably through their nose for the length of time the thermometer is in their mouth
Temporal artery thermometer

The temporal artery thermometer scans across the forehead of the individual in a single direction and senses the infrared emissions that radiate from the skin. One advantage of this device is that there is no need for disposable covers because the device can be cleaned with alcohol swabs between individuals. Another advantage is that the device doesn’t actually touch the skin of the individual so can be used on a sleeping child. A disadvantage of this mode is that its reliability and validity have not been tested widely to ensure accuracy (McCallum & Higgins 2012).

STEPS IN OBTAINING AN ACCURATE MEASUREMENT OF BODY TEMPERATURE

To obtain an accurate measurement of body temperature and to promote the individual’s comfort and safety, the nurse should:

- Select the appropriate site
- Check that the thermometer is undamaged, not contaminated and is working properly

Temporal artery thermometer

The temporal artery thermometer scans across the forehead of the individual in a single direction and senses the infrared emissions that radiate from the skin. One advantage of this device is that there is no need for disposable covers because the device can be cleaned with alcohol swabs between individuals. Another advantage is that the device doesn’t actually touch the skin of the individual so can be used on a sleeping child. A disadvantage of this mode is that its reliability and validity have not been tested widely to ensure accuracy (McCallum & Higgins 2012).

Steps in obtaining an accurate measurement of body temperature

To obtain an accurate measurement of body temperature and to promote the individual’s comfort and safety, the nurse should:

- Select the appropriate site
- Check that the thermometer is undamaged, not contaminated and is working properly

Visitor site

Using the axilla provides a less accurate measurement of body temperature, but may be used when it is not possible to measure the temperature orally (see Clinical Interest Box 20.2). It is safe and non-invasive and can be used with newborns and unconscious individuals. The thermometer is placed in the axilla in contact with two dry skin surfaces and is kept in place in the axilla by bringing the person’s arm over their chest (Figure 20.3). A disadvantage of using this site is that the thermometer must be left in place for a long time to obtain an accurate measurement; it can be affected by exposure to environmental factors and requires continuous positioning by the nurse (Sund-Levander & Grodzinsky 2013).

The skin

Various types of single-use disposable thermometers are available. A temperature-sensitive strip of tape is placed on the forehead or abdomen to record the heat of the body (Figure 20.4). These are often used in nurseries of newborns. Directions on the package explain how to use these thermometers. Most disposable thermometers will register the temperature within 60 seconds. The advantages of this site are that it is inexpensive, provides continuous reading and is safe and non-invasive. The disadvantages are that measurement lags behind other sites during temperature changes, it is sometimes affected by environmental temperature, diaphoresis or sweat can impair adhesion and due to a newborn’s sensitive skin it must be moved frequently (Schafer et al 2014).

Clinical interest box 20.2

Axillary temperature in paediatrics

- Axillary temperature cannot be relied on to detect fevers in infants and young children
- Although axillary temperature has a lower sensitivity, it is safe and has no complications. The thermometer must be kept in place for 5 minutes (Sahin et al 2012)
- Infants are sensitive to slight changes in environmental temperatures

Figure 20.3 Taking temperature from the axilla (© Elsevier Australia)

Figure 20.4 Disposable, single-use thermometer strip (Potter & Perry et al 2013)
Ensure that the person is informed of the procedure
Position the person according to the site selected
Wash hands to prevent cross-infection and ensure that the thermometer has been disinfected before the procedure
Use the correct probe for the site selected when using an electronic thermometer.

Depending on the site being used, some variations occur in the time that the thermometer is left in position, the normal range of temperature and the position in which the person is placed (see Table 20.1). Because of variations between sites it is important to note on the observation or vital signs chart what method was used to take the temperature. For example, if the temperature was taken orally, the temperature would be recorded: 36.7 PO (Latin: *per os* (by mouth)). Temperature measurements are then usually recorded on graph-style charts (Figure 20.5). These enable the pattern of temperature variations to be observed readily. While the actual procedure for measuring temperature may vary slightly in different healthcare settings, the general principles remain the same (see Clinical Skill 20.1).

### Alterations in body temperature

Core body temperature is tightly regulated and reflects body function, and a deviation from the acceptable temperature range is an indication of body dysfunction. An imbalance between the production and the loss of heat results in a rise or fall in normal body temperature. An elevated temperature can be referred to as either hyperthermia or fever, although these two terms have different meanings. A temperature above 41°C is referred to as hyperpyrexia. A temperature below the acceptable range is referred to as hypothermia.

**Hyperthermia** occurs when the heat-loss mechanisms within the hypothalamus fail, resulting in excessive heat production which exceeds the body's adaptive abilities. This can be a manifestation of a metabolic disorder or induced by various medications (Musselman & Saely 2013). **Fever** is generally defined as a temperature above 38 degrees, and occurs when the hypothalamus increases the core body temperature in response to an infection (Musselman & Saely 2013). **Hypothermia** is a body temperature below 35 degrees and is not compatible with life (Grainger 2013). Alterations in body temperature produce certain physiological effects, as shown in Table 20.2.

### Nursing care of an individual with altered body temperature

#### Hyperthermia and fever

The first priority for an individual with hyperthermia is to assess their airway, breathing and circulation, and then this level, the activity of the cells is decreased, less heat is produced and sleepiness and coma can develop (Sundler-Levander & Grodzinsky 2013). Those at risk of hypothermia include postoperative individuals who have been cooled during surgery, newborn infants, elderly or debilitated individuals and any person who is subjected to prolonged exposure to a cold environment (Grainger 2013). Alterations in body temperature produce certain physiological effects, as shown in Table 20.2.
Figure 20.5  Adult Deterioration Detection System (ADDS) chart with blood pressure table, draft version


Continued
# CLINICAL SKILL 20.1 Assessing body temperature

Review and carry out the standard steps for all clinical skills/interventions

**NMBA Decision-making Framework considerations:**
1. Am I educated?
2. Am I authorised?
3. Am I competent?
If you answer ‘no’ to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

**Equipment:**
- Appropriate thermometer
- Disposable probe cover or sleeve
- Pen (blue/black) and observation chart

<table>
<thead>
<tr>
<th>Skill activity</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before assessing body temperature</strong></td>
<td></td>
</tr>
<tr>
<td>Review standard steps for all nursing procedures or interventions</td>
<td>These steps must be performed consistently with each individual to ensure safe nursing care is provided</td>
</tr>
<tr>
<td>Assess the individual for temperature alterations and anything that may interfere with the accuracy of temperature measurement&lt;br&gt;Wait 15–20 minutes if the individual has smoked or ingested hot or cold foods or fluids</td>
<td>Physical signs and symptoms of temperature alterations may be present such as the individual being flushed or shivering&lt;br&gt;If using an oral thermometer, intake of some foods can cause inaccurate readings&lt;br&gt;If using a tympanic thermometer, hearing aids can increase temperature readings</td>
</tr>
<tr>
<td>Determine appropriate temperature site and temperature device for the individual</td>
<td>Different individuals will have different requirements due to their health conditions</td>
</tr>
<tr>
<td><strong>Assessing body temperature with a tympanic membrane electronic thermometer</strong></td>
<td>Ensures comfort and exposes auditory canal for accurate temperature measurement. Ensures individual safety and comfort</td>
</tr>
<tr>
<td>Assist the individual in assuming a comfortable position, with head turned away from the nurse</td>
<td>Lens cover of speculum must not be impeded by earwax (will not obtain an accurate measurement). Switch to other ear or select an alternative measurement site</td>
</tr>
<tr>
<td>Observe for ear wax (cerumen) in individual’s ear canal</td>
<td>Base provides battery power. Soft plastic probe cover prevents transmission of microorganisms</td>
</tr>
<tr>
<td>Remove thermometer from charging base and slide disposable speculum cover over otoscope-like tip until it locks into place, being careful not to touch lens cover</td>
<td>The less acute the angle of approach the better the probe will seal inside the auditory canal</td>
</tr>
<tr>
<td>If holding handheld unit with right hand, obtain temperature from individual’s right ear; left-handed persons should obtain temperature from individual’s left ear</td>
<td>Correct positioning of probe will ensure accurate readings as there will be maximum exposure of the tympanic membrane</td>
</tr>
<tr>
<td>Insert speculum into ear canal, following manufacturer’s instructions for tympanic probe positioning. Pull pinna backwards, up and out for an adult, move thermometer in a figure-eight pattern, fit probe snugly in canal and do not move, point towards the nose</td>
<td>Depression of scan button causes infrared energy to be detected. Otoscope tip must stay in situ until signal occurs to ensure accurate measurement</td>
</tr>
<tr>
<td>As soon as probe is in place, depress scan button. Leave thermometer probe in place until an audible signal is given and individual’s temperature appears on the digital display</td>
<td>Reduces transmission of microorganisms</td>
</tr>
<tr>
<td>Carefully remove speculum from auditory meatus. Push ejection button on unit to discard plastic probe cover into an appropriate receptacle</td>
<td></td>
</tr>
</tbody>
</table>

Continued
### CLINICAL SKILL 20.1 Assessing body temperature—cont’d

<table>
<thead>
<tr>
<th>Action</th>
<th>Reason</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return handheld unit to charging base</td>
<td>Protects sensor tip from damage and keeps unit charged ready for next use</td>
<td></td>
</tr>
<tr>
<td>Assist individual in reassuming a comfortable position</td>
<td>Restores comfort and sense of wellbeing</td>
<td></td>
</tr>
<tr>
<td>Perform hand hygiene</td>
<td>Reduces risk of transmission of microorganisms</td>
<td></td>
</tr>
<tr>
<td>Discuss findings with individual as needed</td>
<td>Promotes participation in care and understanding of health status</td>
<td></td>
</tr>
<tr>
<td>If this is the first time temperature has been measured, if in normal range establish as baseline</td>
<td>Used to compare future readings</td>
<td></td>
</tr>
<tr>
<td>If this is not the first time, compare with baseline and acceptable temperature range for individual’s age group</td>
<td>Normal body temperature fluctuates within normal range, comparison of readings can reveal presence of abnormality</td>
<td></td>
</tr>
<tr>
<td>Record the time and temperature on the vital signs chart. Record measurements in the progress notes if the temperature was elevated and report abnormal findings to the relevant Registered Nurse or medical officer</td>
<td>Verifies that temperature was taken and makes measurement data available</td>
<td></td>
</tr>
</tbody>
</table>

**Measurement of body temperature with electronic thermometer**

**Oral temperature**

- Remove thermometer from charging unit. Slide disposable plastic probe cover over thermometer probe until cover locks in place
  - Charging provides battery power. Soft plastic cover prevents transmission of microorganisms
- Ask the individual to open their mouth then gently place thermometer probe under the tongue in posterior sublingual pocket lateral to centre of jaw
  - Heat from superficial blood vessels in sublingual pocket produces temperature reading
- Ask individual to hold thermometer probe with lips closed
  - Maintains proper position of thermometer during recording
- Leave thermometer probe in place until audible signal occurs and individual’s temperature appears on digital display
  - To ensure accurate reading, probe must stay in place until signal occurs
- Remove thermometer probe from under individual’s tongue, push ejection button and discard plastic probe cover into an appropriate receptacle
  - Reduces risk of transmission of microorganisms
- Return thermometer to storage position of thermometer unit and return to charger
  - Maintains battery charge
- Discuss findings with individual as needed
  - Promotes participation in care and understanding of health status
- If this is the first time temperature has been measured, if in normal range establish as baseline
  - Used to compare future readings
- If this is not the first time, compare with baseline and acceptable temperature range for individual’s age group
  - Normal body temperature fluctuates within normal range, comparison of readings can reveal presence of abnormality
- Record the time and temperature on the vital signs chart. Record measurements in the progress notes if the temperature was elevated and report abnormal findings to the relevant Registered Nurse or medical officer
  - Verifies that temperature was taken and makes measurement data available
### CLINICAL SKILL 20.1 Assessing body temperature—cont’d

#### Measurement of axillary temperature

<table>
<thead>
<tr>
<th>Action</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draw curtain around bed and/or close door</td>
<td>Provides privacy</td>
</tr>
<tr>
<td>Position individual either lying supine or sitting and move clothing away from shoulder and arm</td>
<td>Provides easy access to axilla and exposes area for correct thermometer probe placement</td>
</tr>
<tr>
<td>Remove thermometer from charging unit. Slide disposable plastic probe cover over thermometer probe until cover locks in place</td>
<td>Charging provides battery power. Soft plastic cover prevents transmission of microorganisms</td>
</tr>
<tr>
<td>Raise individual’s arm away from torso and make sure the axilla is dry</td>
<td>Moisture may interfere with accurate reading and give a false low reading</td>
</tr>
<tr>
<td>Place thermometer into centre of axilla, lower arm over probe and place arm across individual’s chest</td>
<td>Maintains position of thermometer against blood vessels in axilla</td>
</tr>
<tr>
<td>Hold thermometer in place until audible signal occurs and individual’s temperature appears on digital display; remove probe from axilla</td>
<td>Ensures an accurate reading</td>
</tr>
<tr>
<td>Push ejection button on thermometer probe stem to discard plastic probe cover into an appropriate receptacle</td>
<td>Reduces risk of transmission of microorganisms</td>
</tr>
<tr>
<td>Return thermometer to storage position of thermometer unit and return to charger</td>
<td>Maintains battery charge</td>
</tr>
<tr>
<td>Assist individual to assume a comfortable position</td>
<td>Restores comfort and promotes privacy</td>
</tr>
<tr>
<td>Discuss findings with individual as needed</td>
<td>Promotes participation in care and understanding of health status</td>
</tr>
<tr>
<td>If this is the first time temperature has been measured, if in normal range establish as baseline</td>
<td>Used to compare future readings</td>
</tr>
<tr>
<td>If this is not the first time, compare with baseline and acceptable temperature range for individual’s age group</td>
<td>Normal body temperature fluctuates within normal range, comparison of readings can reveal presence of abnormality</td>
</tr>
<tr>
<td>Record the time and temperature on the vital signs chart. Record measurements in the progress notes if the temperature was elevated and report abnormal findings to the relevant Registered Nurse or medical officer</td>
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</tbody>
</table>

#### Measuring temporal artery temperature

<table>
<thead>
<tr>
<th>Action</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure the forehead is dry</td>
<td>Moisture may interfere with accurate readings</td>
</tr>
<tr>
<td>Place sensor flush on individual’s forehead</td>
<td>Ensures accurate measurement</td>
</tr>
<tr>
<td>Press red scan button with your thumb. Then slowly slide the thermometer straight across the forehead while keeping the sensor flush with the skin</td>
<td>Scanning for the highest temperature continues until you release the scan button</td>
</tr>
<tr>
<td>Keeping the scan button pressed, lift the sensor from the forehead and touch the sensor to the skin on the neck just below the earlobe. Peak temperature occurs when the clicking sound during scanning stops. Then release scan button</td>
<td>Sensor confirms highest temperature behind the ear lobe</td>
</tr>
<tr>
<td>Clean sensor</td>
<td>Prevents transmission of microorganisms</td>
</tr>
<tr>
<td>Assist individual to assume a comfortable position</td>
<td>Restores comfort and promotes privacy</td>
</tr>
</tbody>
</table>

Continued
CLINICAL SKILL 20.1 Assessing body temperature—cont’d

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss findings with individual as needed</td>
<td>Promotes participation in care and understanding of health status</td>
</tr>
<tr>
<td>Perform hand hygiene</td>
<td>Reduces risk of transmission of microorganisms</td>
</tr>
<tr>
<td>If this is the first time temperature has been measured, if in normal range establish as baseline</td>
<td>Used to compare future readings</td>
</tr>
<tr>
<td>If this is not the first time, compare with baseline and acceptable temperature range for individual’s age group</td>
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</tr>
<tr>
<td>Record the time and temperature on the vital signs chart. Record measurements in the progress notes if the temperature was elevated and report abnormal findings to the relevant Registered Nurse or medical officer</td>
<td>Verifies that temperature was taken and makes measurement data available</td>
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</tbody>
</table>

Note:
- In an infant or young child it may be necessary to hold the arm against the child's side when using axillary method. If infant is in a side-lying position, the lower axilla will record the higher temperature.
- Do not use axilla if skin lesions are present because local temperature may be altered and area may be painful to touch.

(Crisp et al 2013; Perry et al 2012; Rebeiro et al 2012; Tollefson et al 2012)

Investigate why they have this condition (Vijay 2014). The nurse should ask the following questions:
- Have I accurately checked this temperature? Did the person recently have a hot drink?
- Can I check this with another device to reduce user or device errors?
- Why is the individual febrile?
- What other clinical information such as tachycardia adds to the clinical picture of the individual?
- Who should I inform of this clinical change in the individual’s assessment—the nurse in charge or the medical officer?

These questions need to be answered prior to any care aimed at reducing the temperature, as the medical officer may want to obtain blood cultures while the individual is febrile to identify any microorganisms causing an infection in the individual. Giving medications to reduce an individual's fever prior to obtaining blood cultures can affect the results (Clinical Excellence Commission 2012). The most important question to always ask is ‘Why, and what other pieces of assessment data add to the clinical picture?’ Is the individual febrile, tachycardic, with burning sensation on urination, or is the individual febrile, tachycardic, tachypnoeic with a productive cough? When coupled with other assessment data the potential reasons the individual is febrile can be identified and treated.

Once the need for collection of blood cultures is assessed or potential reasons for hyperthermia are identified the nurse should focus on the following areas and nursing actions:
- Reducing body temperature to an acceptable range through administration of prescribed medication such as antipyretics and antibiotics. This is very important as it will reduce the individual's metabolic demands and oxygen consumption. The person's vital signs should be measured 30 minutes after completion.
- Sponging the individual with tepid water.
- Relieving any associated discomfort through regular mouth care and ensuring the individual's bed linen is clean and dry.
- Encouraging rest to decrease the production of body heat.
- Continually checking the individual's skin colour, temperature and general condition to assess the effectiveness of nursing interventions.
- Monitoring renal function and maintaining nutritional and fluid status through providing adequate fluids, which are necessary to prevent dehydration. The individual should be encouraged to drink large amounts of cool or iced fluids. If the person is unable to tolerate fluids orally, intravenous administration of fluids may be necessary. The input and output of all fluids should be closely monitored and the person observed for any signs of dehydration (Vijay 2014).

Information on the signs and symptoms of dehydration is provided in Chapter 26.

A rigor sometimes occurs in response to the physiological processes associated with hyperthermia. The nurse should assess the individual’s condition throughout the three typical stages of a rigor, and implement the nursing actions necessary to promote individual comfort:
- Stage 1: As the body temperature begins to rise the individual feels cold and may shiver violently. Comfort should be promoted by keeping the individual warm but avoiding overheating. The intake of fluids should be encouraged.
- Stage 2: The temperature rises to approximately 40°C and the individual feels very hot and uncomfortable. Minimal clothing and bed linen should be used and other actions to reduce the body temperature should be implemented; for example, encouraging the individual to drink large amounts of cool fluid.
- Stage 3: Profuse sweating occurs and as a result body temperature begins to fall. Actions to reduce temperature should be stopped and any damp clothing or bed linen should be changed to maintain a dry environment. The individual should be encouraged to rest quietly in an attempt to reduce the production of body heat.

**Hypothermia**

Hypothermia can occur due to physiological factors such as an impaired hypothalamus and inadequate heat production to counteract heat loss. Hypothermia can occur from other factors such as excessive heat loss. The first priority of any changes to an individual’s temperature is to assess their airway, breathing and circulation, as this is compromised during moderate to severe hypothermia, then the cause must be investigated (Kunde 2014). See the section above on hyperthermia for questions to ask prior to treatment of any alterations in temperature.

The aims and nursing actions of caring for an individual with hypothermia include:
- Restoring body temperature to an acceptable range through passive warming, such as additional blankets or a space blanket, or active warming, increasing the ambient temperature or applying forced-air blanket systems (Kunde 2014). Rewarming needs to occur slowly to avoid haemodynamic changes and possible shock (Scaravilli et al 2012).
- Relieving any discomfort associated with hypothermia
- Encouraging mobilisation to increase the production of body heat if the individual is able to stand
- Maintaining nutritional and fluid status through encouragement of warm food or fluid that is high in carbohydrate to aid heat production.
- Continually checking the individual’s vital signs and general condition to assess the effectiveness of nursing interventions.

**PULSE**

With each contraction of the heart the increased volume of blood pushed into the arteries can be palpated at certain points on the body (Elliott & Coventry 2012). Measuring the pulse or heart rate, which is one of the measurable characteristics of the pulse, gives the nurse vital information about the health of an individual. The pulse can be affected by a variety of factors including age, medical conditions, medications and fluid status.

As described in Chapter 25, the cardiovascular system transports essential substances to the tissues, and waste substances from the tissues to various organs for excretion. An adequate supply of blood is necessary for the cells to function effectively, and any disruption to the blood supply may have serious consequences. An adequate flow of blood throughout the body is dependent on the ability of the heart to pump, the ability of the blood vessels to transport the blood and the quantity and quality of the blood.

The most important factor responsible for the transport of substances to the tissues is cardiac output, which is the volume of blood pumped by the heart during each minute. It is the product of the volume of blood pumped at each beat (stroke volume) and the number of beats during one minute (heart rate). A healthy heart in a healthy adult ejects 5–6 litres of blood per minute (Marik 2013). This amount can be increased by an increase in either heart rate and/or stroke volume and can also vary with:
- Body size, as cardiac output increases in proportion to the surface area of the body
- Age, as with increasing age the cardiac output decreases
- Posture, as cardiac output is greater when a person is standing
- Exercise, as the greater the degree of physical activity the greater the cardiac output needs to be. Strenuous physical activity can result in an increased heart rate and a cardiac output of 30 L/min
- A sudden increase in total blood volume; for example, the infusion of fluid intravenously
- Certain disease states—cardiac output is increased in conditions such as pulmonary disease and anaemia, and is decreased in conditions such as shock or myocardial infarction.

The rate at which the heart beats is controlled by the conducting system of the heart and the autonomic nervous system. The sinoatrial node initiates impulses that spread throughout the conducting system and to all areas of the cardiac muscle, resulting in atrial then ventricular contraction. Stimulation of the parasympathetic nerve fibres, primarily the vagus nerves, reduces the heart rate, while stimulation...
UNIT 6 | Health assessment

of the sympathetic nerve fibres increases the heart rate. Various chemicals and ions can also affect heart activity; for example, adrenaline inhibits the parasympathetic nerves, resulting in increased heart rate. An excess of potassium ions in the blood decreases the ability of the heart to contract. Heart, and therefore pulse, rate varies according to age, gender, body build, level of physical activity and emotions.

Assessing the pulse

Cardiovascular function is assessed by monitoring the pulse and blood pressure as well as observing the general appearance of the individual and detecting the signs and symptoms of dysfunction, such as cyanosis, pallor, cool skin temperature, oedema and dyspnoea. The frequency with which the pulse and blood pressure are assessed depends on the person's condition and how closely it needs to be monitored. Residents in long-term care facilities will generally require pulse and blood pressure measurement infrequently, whereas people who are acutely ill may have continuous monitoring or measurements performed at intervals ranging from every 30 minutes to six times a day.

Assessment of the pulse characteristics, which includes strength, equality and regularity, provides significant information about a person’s cardiac function and peripheral perfusion (Elliott & Coventry 2012). The waves of blood that cause pulsation through the arteries can be felt when a superficial artery is partially compressed by the fingers, and is most easily felt over a large artery that lies close to the skin and crosses over a bone or firm tissue (see Clinical Skill 20.2).

Pulse sites

The pulse sites (Figure 20.6) where the pulse may be palpated are:

- **Temporal**: the temporal artery is palpated immediately in front of the ear
- **Carotid**: the carotid artery is palpated at the front of the neck, to the side of the thyroid cartilage
- **Apical**: the apical pulse is the beat heard at the apex of the heart, and is assessed using a stethoscope. The stethoscope is placed over the apex of the heart, in the left centre of the chest just below nipple level
- **Brachial**: the brachial artery is palpated in the antecubital fossa at the elbow joint
- **Radial**: the radial artery is palpated in the wrist just above the thumb
- **Femoral**: the femoral artery is palpated in the inguinal area
- **Popliteal**: the popliteal artery is palpated at the back of the knee (Figure 20.7)
- **Posterior tibial**: the posterior tibial artery is palpated just behind the medial malleolus of the ankle (Figure 20.8)
- **Pedal**: the dorsalis pedis artery is palpated on the anterior surface of the foot (Figure 20.9).

The radial artery is the most commonly used site, as it is conveniently located and readily accessible (Figure 20.10). The femoral or carotid sites may be used if it is difficult to palpate the radial artery easily; for example, the individual has poor peripheral perfusion. The remaining sites are used when there are specific indications for assessing the flow of blood through a particular artery; for example, the popliteal and pedal pulses are assessed after certain types of surgery to the leg.
The apical pulse is assessed when a more accurate estimation of heart rate or regularity is required, or when there is any doubt about the rate or regularity of a peripheral pulse (Figure 20.11). It is routinely used for infants and children up to 3 years of age. Apical–radial pulse assessment may be indicated for an individual with certain cardiovascular disorders. This assessment requires two healthcare workers as one person palpates and assesses the radial pulse while a second person assesses the apical pulse at the same time—the apical and radial rates should be identical. Some heartbeats that can be detected at the apex are not strong enough to be palpated at peripheral sites. Any difference between the two measurements is called the pulse deficit, and should be reported immediately.

**Character of the pulse**

The pulse is assessed for rate, regularity and strength:

- **Rate:** the pulse rate is the number of beats per minute, and the acceptable rate varies according to age: 120–140 beats/min for an infant, 90–120 beats/min for a child, 60–100 beats/min for an adult. It should be noted that athletes and other physically fit individuals commonly have a pulse rate below 60 beats/min. A large proportion of elderly people also have a pulse rate below 60 beats/min.
The pulse in older adults

It is often difficult to palpate the pulse of an older adult or obese individual. A stethoscope provides a more accurate reading. Once elevated, the pulse rate of an older adult takes longer to return to a normal resting rate.

Factors affecting pulse characteristics

The pulse characteristics can vary according to age (see Clinical Interest Box 20.3), sex, body build, level of physical activity, fever, medications, haemorrhage, position changes, pregnancy, stress and emotions. The pulse may also be affected during various disease states, which result in alterations to its character.

Rate

An increase in the pulse rate above 100 beats/min is called tachycardia and may result from fear, anxiety, excitement, anger or pain. Tachycardia may also occur in conditions such as haemorrhage, shock, fever, thyrotoxicosis or congestive cardiac failure. A decrease in the pulse rate below 60 beats/min is called bradycardia and may occur during absolute relaxation or sleep. Bradycardia may also occur in conditions such as cerebral haemorrhage, heart block, myxoedema or drug toxicity, such as with digitalis.

Regularity

An irregular rhythm, when the intervals between each beat vary, is called arrhythmia, or dysrhythmia, and may occur in conditions such as electrolyte imbalance or cardiac tissue damage. Examples of irregular rhythm include:

- Ectopic beats, which are premature heartbeats and may be occasional or frequent
- Coupled beats (or bigeminal pulse), in which two beats in close succession are followed by a pause during which no pulse is felt
- Atrial fibrillation, in which fibrillation of the atria results in random ventricular contractions and, consequently, an irregular pulse.

Strength

An increased strength, when the pulse is referred to as being full and bounding, can result from strenuous physical exercise or strong emotions. An increased strength can also occur in conditions such as hypertension, thyrotoxicosis or aortic valve incompetence. A decreased strength, when the pulse is referred to as being weak and thready, can occur in conditions such as haemorrhage, shock, acute myocardial infarction or cardiac failure. When the pulse is so weak that it cannot be palpated it is referred to as being imperceptible.

When assessing the pulse, any deviations from an individual’s acceptable range should be reported immediately and documented. Pulse measurements are recorded and graphed on an Adult Deterioration Detection System chart (see Figure 20.5) which allows healthcare workers to see changes and trends in an individual’s measurements.

Alterations in pulse rate

For an individual with an altered pulse rate, the priority should be ensuring a full vital sign assessment has been completed and documented to ensure that acute deterioration is identified and managed appropriately (Clarke 2014). The nurse should ask the following questions:

- Have I completed the assessment accurately?
- Is this normal for this individual?
- What other clinical information is consistent with an altered pulse rate?
- Do I need to inform the appropriate person of alterations in the individual’s condition?

As healthcare becomes more complicated due to individuals with co-morbidities, it is essential that nurses use the decision-making framework and their clinical judgment to ensure a positive outcome for the individual (Purling & King 2012).

Review Case Study 20.1 and apply the above information when answering the questions.

Critical Thinking Exercise 20.2

1. Rita Ryan has been allocated into your care and you conduct a vital sign assessment. The pulse you palpate is irregular and fast at 150 beats per minute. Using Figure 20.5, identify what action you would take next while caring for Rita.
2. Rita asks you what an irregular pulse means. How would you answer her question?
3. A medical officer asks you to palpate bilateral popliteal pulses and document the results. Where do you place your fingers?
4. What are the possible reasons for requesting bilateral pulses be palpated and documented?

Respiration

Oxygen, a colourless and odourless gas, makes up about 20% of the atmosphere, and is essential for sustaining most forms of life. The respiratory system gives the body the ability to absorb oxygen and excrete waste products, such as carbon dioxide. The capillary alveoli membrane in the lungs allows the exchange of oxygen from the atmosphere to the bloodstream and carbon dioxide to be diffused out. (Further information about the structure and function of the respiratory system is provided in Chapter 25.)

The cardiovascular system and the respiratory system work together to bring about respiration, the exchange of
The presence of excess carbon dioxide causes the respiratory rate to increase until the excess carbon dioxide is eliminated. Conversely, a decreased carbon dioxide level slows the respiratory rate (Klocke 2014).

**Factors affecting respiratory function**

Factors that affect the process of respiration include:

- **Availability of oxygen.** Oxygen makes up 20% of the air and normally this is sufficient to meet the needs of the body, but a decrease in this amount of oxygen can cause problems. Two instances where the available oxygen may be deficient are:
  1. High altitude. The total pressure of all gases, including oxygen, in the air decreases at high altitude. Therefore, people experience difficulty in obtaining adequate oxygen until they become acclimatised. As a result, the respiratory rate is increased in an attempt to supply the body with sufficient oxygen.
  2. The presence of noxious gases. Noxious gases in the air displace the oxygen and reduce the amount normally available for inspiration (Klocke 2014).
- **Regulating mechanisms.** Any factor that interferes with the control mechanisms in the respiratory centre of the brain may cause respiratory difficulties; for example, cerebral oedema or medications such as morphine. Respirations increase when the pH of the blood is lowered, as a respiratory response to rid the body of the excess acid.
- **Passage of oxygen and carbon dioxide.** The efficiency of respiration can be affected by any factor that obstructs the patency of the respiratory tract or the actions of the respiratory muscles; for example, an accumulation of secretions resulting from a reduced cough reflex. Respirations may be reduced by factors that affect the actions of the respiratory muscles; for example, injury or disease that restricts the movements of the diaphragm (Klocke 2014).
- **Diffusion of oxygen and carbon dioxide.** Any dysfunction of the lungs (e.g. pulmonary oedema, asthma or chronic obstructive airways disease) may impede the transfer of oxygen and carbon dioxide (Klocke 2014). (Information on these and other respiratory disorders is provided in Chapter 25.)
- **Transport of oxygen and carbon dioxide to and from the cells.** Any condition affecting the efficiency of the heart, the blood vessels or the blood can interfere with the transportation of oxygen to the cells and carbon dioxide away from the cells. Such conditions include congestive cardiac failure, atherosclerosis and anaemia. (Information on these and other cardiovascular disorders is provided in Chapter 25.)
- **Influences on the rate, depth and rhythm of breathing.** Several factors influence the characteristics of breathing; for example, the degree of physical activity. Oxygen requirements are greatest during exertion and least during sleep. The respiratory rate and depth vary in response to the body’s demand for oxygen; for example, during strenuous exercise the volume of air drawn into
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The rate of respiration varies according to age, level of activity and emotions. The normal respiratory rates according to age are about 20–40 breaths per minute for a 1-year-old, 20–30 in a 3-year-old, 16–22 in a 6-year-old and 12–20 in an adult (Kinney 2014; Van Kuiken & Huth 2013).

- **Rhythm.** The rhythm of respiration is the pattern or regularity of breathing. Normal respirations are evenly spaced, with little variation from one breath to another.
- **Depth.** Depth of respirations depends on the volume of air being inhaled and exhaled with each respiration. The depth should be constant with each breath and is assessed by observing the individual's chest movement for adequate expansion. Respirations are described as being normal, shallow or deep.
- **Sound.** Normal respirations are inaudible (Klocke 2014).

Assessing respirations

An individual’s respiratory status is the first observation that will indicate a deterioration in a person’s condition and predict a serious adverse event, such as cardiac arrest (Philip et al 2013). Assessment is not only to ascertain whether the individual is receiving an adequate supply of oxygen to meet their body's needs, but aids in evaluating airway patency, the status of the respiratory muscles and the individual’s metabolic state (Elliott & Coventry 2012). Assessment is made by observing the individual for signs and symptoms of an inadequate oxygen supply, assessing their respirations and identifying any deviations from normal. The frequency with which respirations are subsequently assessed depends on how closely the individual’s condition needs to be monitored. Residents in long-term care facilities commonly have their respirations assessed less often than acutely ill individuals, whose condition may need to be monitored continuously.

Respirations are assessed without the individual’s knowledge by noting the rise and fall of the chest. If a person is aware that their respirations are being assessed they may become conscious of them and may unintentionally change their character. The nurse may assess the respirations by observing the person or by placing a hand on the individual’s chest to feel the rise and fall. To avoid making the individual aware that their respirations are being assessed, the nurse may place fingers on the person’s radial pulse site and continue as if counting the pulse (Elliott & Coventry 2012). (See Clinical Skill 20.3.)

Respirations are assessed for rate, rhythm, depth and sound:

- **Rate.** The respiratory rate is the number of respirations per minute. One inhalation and one exhalation equal one respiration (Figure 20.12). The rate of respiration varies according to age, level of activity and emotions. The normal respiratory rates according to age are about 20–40 breaths per minute for a 1-year-old, 20–30 in a 3-year-old, 16–22 in a 6-year-old and 12–20 in an adult (Kinney 2014; Van Kuiken & Huth 2013).
- **Rhythm.** The rhythm of respiration is the pattern or regularity of breathing. Normal respirations are evenly spaced, with little variation from one breath to another.
- **Depth.** Depth of respirations depends on the volume of air being inhaled and exhaled with each respiration. The depth should be constant with each breath and is assessed by observing the individual’s chest movement for adequate expansion. Respirations are described as being normal, shallow or deep.
- **Sound.** Normal respirations are inaudible (Klocke 2014).

Assessing respiratory status and identifying any actual or potential problems are assisted by obtaining information from an individual regarding:

- Allergic reactions, such as coughing, sneezing or shortness of breath, that occur as a result of exposure to allergens such as dust, pet hairs or pollen
- Smoking habits
- Presence of a cough and/or the production of sputum
- Chest pain.
It is important to observe the skin colour for signs of cyanosis. **Cyanosis** is a bluish discolouration of the skin and mucous membranes due to inadequate oxygenation and can be either peripheral or central. Peripheral cyanosis is caused by local vasoconstriction and is usually visible only in the nail beds and sometimes the lips. Central cyanosis is the result of prolonged **hypoxia** (diminished availability of oxygen to the body tissues) and affects all body organs. It is most visible in highly vascular areas such as the lips, nail beds, tip of the nose, the external ear and the underside of the tongue. In people with naturally dark brown or black skin, cyanosis can be most readily detected by inspecting the mucosa inside the lips.

Cyanosis may result from disorders that limit the volume of air entering the lungs or from obstructive lung diseases such as asthma and emphysema. The signs and symptoms of hypoxia and respiratory distress include:

- Elevated blood pressure and pulse rate
- Shortness of breath and fatigue
- Cyanosis
- Abnormal ventilations
- Use of accessory muscles during breathing and flaring of the nares
- Retraction of the sternum and intercostal muscles
- Apprehension or agitation
- Confusion or reduced level of consciousness
- Visible perspiration.

A person who has a chronic respiratory disorder should also be observed for a barrel-shaped chest, which is a thoracic deformity commonly associated with chronic obstructive airways disease. When chronic hypoxia exists, a person experiences general fatigue and intolerance to exercise and may have clubbing of the fingers (Hill Bailey et al 2013).

### Alterations in respirations

Research suggests that alterations in respiratory rate can be an early sign that the individual is deteriorating. However, research studies have also found that some nurses believe that this observation is not completed as accurately as pulse or blood pressure measurements. It is imperative that accurate measurement of the respirations is done to ensure early signs of clinical deterioration are identified (Philip et al 2013). Many factors may cause alterations to the rate, rhythm, depth or sound of respirations and deviations from the acceptable range and pattern.

#### Rate

An increase in the rate above the acceptable range is called **tachypnoea** and may occur as a result of physical exercise; states such as fear, pain, anxiety, excitement or anger; and disease states such as fever, infection, respiratory disorders, thyrotoxicosis and congestive cardiac failure. A decrease in the rate below the acceptable range is called **bradypnoea** and may occur as a result of absolute rest or sleep, trauma to the brain, uraemia, diabetic coma or medications that depress the respiratory centre, such as morphine.

#### Rhythm

The normal regular pattern of breathing may be altered by a variety of disease states. In obstructive airways disease, such as asthma, chronic bronchitis or emphysema, there is a prolonged expiratory phase. Heart failure or increased intracranial pressure, **Cheyne–Stokes breathing** may occur. This is an abnormal pattern characterised by periods of apnoea. The cycle of Cheyne–Stokes breathing begins with slow shallow breaths that gradually increase in depth and rate. Breathing then gradually becomes slower and more shallow, culminating in a 10–60 second period without ventilation (apnoea), before the cycle is repeated.

#### Depth

If a person inhales and exhales only small amounts of air, the respirations are described as shallow. **Hypoventilation** is the term used to describe a reduced rate and depth of ventilation, and may occur as a result of a decreased response of the respiratory centre to carbon dioxide, or in respiratory disorders such as bronchitis or atelectasis. Unresolved hypoventilation results in hypoxia and increased amounts of carbon dioxide in the blood.

When large amounts of air are inhaled and exhaled the respirations are described as deep. **Kussmaul’s breathing** is the term used to describe abnormally deep, very rapid, sighing respirations. This pattern of breathing may occur as a result of disorders such as renal failure or metabolic acidosis.

**Dyspnoea** is the term used to describe shortness of breath or difficulty in breathing and may occur after strenuous exercise (temporarily) or as a result of certain respiratory or cardiac disorders. Dyspnoea is commonly accompanied by hypoventilation or **hyperventilation**, which is rapid, deep breathing. Sustained hyperventilation, which is sometimes a consequence of extreme anxiety, causes loss of carbon dioxide and a decrease in carbonic acid concentration in the blood. This alters the acid–base balance causing respiratory alkalosis to occur.

**Orthopnoea** is the term used to describe the condition in which an individual must sit up or stand to breathe deeply or comfortably. This condition occurs in various respiratory or cardiac disorders, such as emphysema, pulmonary oedema and asthma.

Pursed-lip breathing is a technique commonly employed by people with severe dyspnoea or orthopnoea; for example, as a consequence of emphysema. This technique of breathing funnels expired air through a narrow opening, thus creating a positive back pressure on the airways to keep them open.

#### Sound

Abnormal breath sounds can occur when air passes through narrowed airways or moisture, or when there is inflammation of the lungs or pleura.

**Sibilant breathing** is the term used to describe laboured respirations that have a snoring sound, which commonly result from an obstructed airway.

**Wheezing** results from narrowed airways, such as in asthma, and respirations sound high pitched and squeaking.
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hand-operated bulb that has a valve which can be tightened and released. The second tube is connected to the manometer that registers millimetre calibrations. Thus, blood pressure is measured in millimetres of mercury (mmHg). Blood pressure cuffs come in various sizes because the bladder must be the correct width and length for the individual’s arm (Figure 20.15). If the bladder is too narrow, the blood pressure reading will be erroneously elevated; if it is too wide, the reading will be erroneously low (Flynn Makic et al 2013).

• The stethoscope, which is used with the sphygmomanometer to hear the Korotkoff sounds, must be used appropriately for an accurate blood pressure measurement to be obtained. When using a doubled-sided stethoscope, ensure it is placed on the appropriate side for the sound you are listening for, either bell or diaphragm. The bell side is for hearing essential that the reading is interpreted as part of the clinical picture of an individual (Slade 2014) (see Clinical Skill 20.4).

**BLOOD PRESSURE**

Blood pressure is the force exerted by the blood on the walls of the blood vessels as the heart contracts and relaxes. The pressure that the blood exerts against arterial walls during contraction of the left ventricle is called the systolic pressure. Diastolic pressure is the arterial pressure during left ventricular relaxation, and is a measurement of the minimum pressure being exerted on the arterial walls (Elliott & Coventry 2012). Measuring blood pressure provides significant information about the individual’s cardiovascular function. A series of blood pressure measurements may show the development of a trend and is therefore more significant than a single measurement.

Blood pressure is maintained by the complex interaction of the body’s homeostatic mechanisms and is influenced and related to:

• Cardiac output
• The force of ventricular contractions
• The viscosity (thickness) of the blood
• Peripheral vascular resistance
• Elasticity of blood vessel walls (Elliott & Coventry 2012).

It is generally measured by a non-invasive or indirect method, using a manometer and a stethoscope. It may also be measured directly by the insertion of a probe or catheter into a blood vessel. Blood pressure varies according to age, time of day, body posture and emotions. Blood pressure is not a routine part of assessment in children under age 3.

**Assessing blood pressure**

Indirect blood pressure measurement is made using one of several devices (Figure 20.14), which include:

• **The sphygmomanometer**, consisting of a cloth-covered rubber bag (the cuff) from which two rubber tubes extend. One of the tubes is connected to a
### CLINICAL SKILL 20.4 Measuring oxygen saturation (pulse oximetry, SpO₂)

**Review and carry out the standard steps for all clinical skills/interventions**

<table>
<thead>
<tr>
<th><strong>NMBA Decision-making Framework considerations:</strong></th>
<th><strong>Equipment:</strong></th>
</tr>
</thead>
</table>
| 1. Am I educated?  
2. Am I authorised?  
3. Am I competent?  
If you answer ‘no’ to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator. | Pulse oximeter monitor  
Sensor probe and cord  
Pen (blue/black)  
Observation chart  
Nail polish remover if required |

<table>
<thead>
<tr>
<th><strong>Skill activity</strong></th>
<th><strong>Rationale</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess for signs and symptoms of alterations in oxygen saturation such as altered respiratory status, cyanotic appearance, restlessness, irritability, confusion, reduced level of consciousness, laboured or difficulty breathing</td>
<td>Physical signs and symptoms may indicate abnormal oxygen saturation</td>
</tr>
<tr>
<td>Assess for factors that normally influence measurement of SpO₂ including oxygen therapy, haemoglobin level and temperature</td>
<td>Allows for accurate assessment of oxygen saturation variations. Peripheral vasoconstriction related to hypothermia can interfere with SpO₂ determination</td>
</tr>
<tr>
<td>Instruct individual to breathe normally</td>
<td>Prevents large fluctuations in respiration and possible error in reading</td>
</tr>
<tr>
<td>Assess the site most appropriate for sensor probe placement. Site must have adequate local circulation and be free of moisture. If finger is to be used, remove nail polish</td>
<td>Peripheral vasoconstriction can interfere with SpO₂ determination. Opaque coatings such as nail polish decrease light transmission</td>
</tr>
<tr>
<td>Determine capillary refill at site. If less than 3 seconds, select alternative site</td>
<td>Cool temperature with vasoconstriction or vascular disease may decrease circulation, impede refill and prevent sensor from measuring SpO₂</td>
</tr>
<tr>
<td>Position individual comfortably. If finger is chosen as monitoring site, support lower arm. Instruct individual to keep sensor probe site still</td>
<td>Movement interferes with SpO₂ determination. Pressure of sensor probe’s spring tension on finger or earlobe may be uncomfortable</td>
</tr>
<tr>
<td>Attach sensor probe to monitoring site</td>
<td>Select sensor site based on peripheral circulation and extremity temperature</td>
</tr>
<tr>
<td>Turn on oximeter by activating power and observe pulse waveform. Correlate oximeter pulse rate with individual’s radial pulse</td>
<td>Enables detection of valid pulse</td>
</tr>
<tr>
<td>Leave probe in place until oximeter readout reaches constant value and pulse display reaches full strength during each cardiac cycle. Read SpO₂ on digital display</td>
<td>Pulse waveform and intensity display enables detection of valid pulse or presence of interfering signal. Reading may take from 10 to 30 seconds</td>
</tr>
<tr>
<td>If continuous SpO₂ monitoring is planned, verify SpO₂ alarm limits, which are pre-set by the manufacturer at a low of 85% and a high of 100%. Limits for SpO₂ and pulse rate should be determined as indicated by individual’s condition. Verify that alarms are on, assess skin integrity under sensor every 2 hours. Relocate sensor at least every 4 hours, and more frequently if skin integrity is altered</td>
<td>Spring tension of sensor or sensitivity to disposable sensor adhesive can cause skin irritation and lead to disruption of skin integrity</td>
</tr>
<tr>
<td>If intermittent or spot-checking SpO₂ measurements are planned, remove sensor probe and turn oximeter power off. Store sensor probe in appropriate location</td>
<td>Sensor probes are expensive and vulnerable to damage</td>
</tr>
</tbody>
</table>
**CLINICAL SKILL 20.4 Measuring oxygen saturation (pulse oximetry, SpO₂)—cont’d**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss findings with individual as needed</td>
<td>Promotes participation in care and understanding of health status</td>
</tr>
<tr>
<td>Remove probe and turn oximeter power off. Clean according to manufacturer’s instructions</td>
<td>Maintains battery charge, reduces risk of transmission of microorganisms</td>
</tr>
<tr>
<td>Assist individual in returning to comfortable position</td>
<td>Restores comfort and promotes sense of wellbeing</td>
</tr>
<tr>
<td>Perform hand hygiene</td>
<td>Reduces risk of transmission of microorganisms</td>
</tr>
<tr>
<td>Document the time of measurement and the rate and character of the respirations on the appropriate chart using numbers or dots</td>
<td>A record of the respirations provides information about the individual’s condition to members of the healthcare team</td>
</tr>
<tr>
<td>Report any deviations from usual acceptable ranges</td>
<td>Appropriate care may be planned and implemented</td>
</tr>
</tbody>
</table>

**Note:**
- Do not attach probe to finger, ear or bridge of nose if area is oedematous or skin integrity is compromised.
- Do not attach sensor to fingers that are hypothermic as vasoconstriction will alter the reading.
- Do not place sensor on same extremity as electronic blood pressure cuff. Blood flow to finger will be temporarily interrupted when cuff inflates and cause inaccurate blood pressure reading that triggers alarm.
- Do not place pulse oximeter on a limb that has an arterial or intravenous line in situ as fluid entering the arterial line may dilute the blood to alter the reading, and an intravenous line may reduce the outflow of blood from the limb so there is congestion of the venous blood, also altering the reading.
- If oximeter pulse rate, individual’s radial pulse rate and apical pulse rate are different, re-evaluate oximeter sensor placement and reassess pulse rates.

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**Figure 20.15 Guidelines for proper blood pressure cuff size**

Cuff width = 20% more than upper arm diameter, or 40% of circumference and two-thirds of arm length

(Potter & Perry et al 2013)

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**Korotkoff sounds** are sounds heard during the taking of blood pressure using a sphygmomanometer and stethoscope. In some individuals, the sounds are clear and distinct, whereas in others only the beginning and ending sounds are heard. As air is released from the cuff, pressure on the brachial artery is decreased and the blood is heard pulsing through the vessel. These sounds are described in phases:

- **Phase I:** systolic pressure indicated by a sharp thump
- **Phase II:** a blowing or whooshing sound that increases as the cuff is deflated
- **Phase III:** crisp intense tapping that occurs with each heartbeat
- **Phase IV:** a softer blowing sound that fades
- **Phase V:** silence (Frese et al 2011).

Blood pressure should be obtained using a sphygmomanometer, manual method, before applying automatic devices and to confirm any abnormal blood pressure readings.
The advantages of automatic devices are the ease of use and efficiency when repeated or frequent measurements are indicated. No stethoscope is required. The microphone or pressure sensor must be positioned directly over the artery for proper function.

**Palpation**

The indirect palpation technique is useful for individuals whose atrial pulsations are too weak to create Korotkoff sounds, such as with severe blood loss and decreased heart contractility; however, the diastolic pressure is difficult to determine by palpation. When the palpation technique is used, the systolic value and the manner in which it was measured are recorded; for example, RA 90/–, palpated, supine. Clinical Interest Box 20.8 outlines the method for palpating the systolic blood pressure.

**Blood pressure sites**

The site commonly used to measure arterial blood pressure indirectly is the brachial artery in the antecubital fossa at the elbow joint (Figure 20.16). If the upper extremities are inaccessible due to dressings, casts, arteriovenous fistulas or shunts, and axillary lymph-node dissection, it may be measured at the popliteal artery behind the knee (Figure 20.17) (see Clinical Skill 20.5).

Blood pressure measurements are recorded using arrows and dots on a graph similar to the one illustrated in Figure 20.5, or in longhand. If the longhand method of recording is used, the systolic pressure is recorded above the diastolic pressure; for example, 120/70 mmHg. If taking an individual's blood pressure for the first time during the current admission, it should be taken in both arms. As the heart is not centrally located, but slightly to the left, there should be a difference of no more than 5–10 mmHg between the arms. The arm found to have the higher pressure should be used for subsequent examinations. Document and record, where appropriate, which arm to use. Figure 20.18 provides the usual site for measuring blood pressure and placement of the stethoscope diaphragm.
Alterations in blood pressure

It is generally considered that an acceptable systolic blood pressure for an adult is 100–120 mmHg, and acceptable diastolic blood pressure ranges from 60–80 mmHg. Commonly, systolic pressure is regarded as being elevated when it is higher than 140 mmHg, and diastolic pressure elevated when it is above 90 mmHg (AIHW 2015) (see Clinical Interest Box 20.9).

The significance of a recorded blood pressure level can only be reliably assessed in the knowledge of previous levels, and in relation to the individual’s current health state. For example, a person with a blood pressure of 95/60 mmHg may be perfectly healthy. Conversely, a person displaying signs of clinical shock but with a blood pressure of 135/90 mmHg may normally have a blood pressure exceeding this level.

At times it may be necessary to measure the blood pressure with the individual assuming first a lying then a standing position, particularly if the person is on certain medications and/or has cardiovascular problems. It is important to report and document any differences observed between the two measurements.

If the blood pressure is to be measured frequently (e.g. every half-hour), the cuff may be left on the person’s arm but, after each measurement, the nurse must ensure that the cuff is deflated completely. Care must be taken to avoid inflating the cuff repeatedly within a short time, as this action may result in venous congestion and cause the individual pain.

Hypertension is the term used to describe an elevated arterial blood pressure. Hypertension is a feature of many disease states but frequently its cause is unclear—when the cause is unclear it is described as ‘essential’ hypertension. The potential for onset of hypertension increases with obesity, smoking, a family history of high blood pressure or high serum sodium or cholesterol levels (AIHW 2015). Hypertension is associated with cardiac enlargement, heart failure, coronary artery disease and cerebrovascular accidents. Sustained hypertension is associated with a high mortality rate, so the importance of preventing and controlling hypertension is considerable (Warren 2014).

Hypotension is the term used to describe a low blood pressure in relation to an individual’s usual pressure. Hypotension is associated with low cardiac output states (e.g. left ventricular failure), and with hypovolaemic and cardiogenic shock. With sustained hypotension the blood pressure is not adequate for normal tissue perfusion and oxygenation and may result in renal failure.

CRITICAL THINKING EXERCISE 20.4

1. You are working in a nursing home and the Registered Nurse asks you to complete a blood pressure reading on a new admission. The individual is morbidly obese and the cuff only just fits around the individual’s arm. How would this affect the accuracy of the reading?
2. You are working in a community health centre and you need to complete a blood pressure reading on a 75-year-old female, Rita Smith. Rita wants to keep her thick woollen jumper on while you complete the blood pressure. How would you respond to Rita’s request?
3. You are caring for Renae Polontee, a 30-year-old apprentice chef, who has accidentally cut off her right thumb. There was considerable blood loss prior to first aid administered at the scene. Would you expect Renae to be hypotensive or hypertensive? Justify your answer.
4. Which arm would you assess Renae’s blood pressure on and why?

RECOGNISING AND RESPONDING TO CLINICAL DETERIORATION IN ACUTE HEALTHCARE

The Australian Commission on Safety and Quality in Health Care (ACSQHC) has released the National Safety and Quality Health Service (NSQHS) Standards, in which one of the standards refers to early recognition of clinical deterioration. Recognition of clinical deterioration, when followed by effective action, can minimise the occurrence of adverse events such as a cardiac arrest (ACSQHC 2012). There are guiding principles that build on this standard and revolve around early recognition of deterioration, documentation and communication, appropriate escalation of care with supportive responses from healthcare staff and maintaining a person-centred care approach (ACSQHC 2010). ACSQHC (2010) identified that changes to respiratory rate, oxygen saturation, heart rate, blood pressure, temperature and level of consciousness indicate deterioration of an individual’s condition. The ACSQHC Working Party developed a colour-coded observation chart, which all hospitals have adopted and customised for local use, to identify when an individual may be deteriorating and what further assessment and escalation of care the nurse should undertake (see the Adult Deterioration Chart, CLINICAL INTEREST BOX 20.9).
Vital signs reflect changes in body function and therefore provide the nurse with important information about the clinical health status of an individual. Various sites and methods can be used to assess vital signs, and the nurse selects the site and method that is safest for the individual and that will provide the most accurate measurement possible. It is important to note that changes in one vital sign can trigger changes in other vital signs. Vital signs are generally assessed when an individual is admitted to a healthcare agency, to establish baseline data, when there is a change or possibility of change in the individual’s condition and as part of routine care. Data obtained from measurements of vital signs are then used to plan and implement appropriate nursing interventions, as well as to evaluate an individual’s response to nursing interventions or prescribed medical therapy. It is important for the nurse to have knowledge of the normal ranges of vital signs and of the factors that regulate and influence vital signs, as this helps them interpret the measurements that deviate from normal. It is also imperative that the nurse has the underpinning clinical knowledge and judgment to recognize and respond to a deteriorating individual and act accordingly to maintain the clinical health status (ACSQHC 2012).
Review Questions
1. What are the factors that can affect vital signs?
2. What are the advantages and disadvantages of using each body temperature site?
3. What characteristics should be included in a respiratory assessment?
4. What is an early indicator of a clinical deterioration in an individual?
5. Ms Hawdon has just given birth to a healthy baby boy. After the delivery she has a postpartum haemorrhage and loses 1200 mL of blood. Would you expect Ms Hawdon’s blood pressure to increase or decrease? State the reason for your answer.
6. Identify two sites for taking blood pressure in an adult. Describe the procedure.
7. What are the three (3) characteristics of a pulse? What characteristic(s) would be altered during atrial fibrillation and why?
8. Mr Ryan, 82 years of age, has just been admitted with shortness of breath. Describe the observation you would conduct.
9. Review the information in the observation chart below, then answer the questions that follow.

| Admission obs | T—36.7, P—100, R—22, B/P—140/90: 1600 hrs |
| Preoperative obs | T—36.4, P—80, R—18, B/P—130/70: 0800 hrs |
| Postoperative obs | T—35.8, P—60, R—16, B/P—120/70: 1400 hrs |
| Day 1 Post op | T—36.4, P—80, R—20, B/P—130/70: 1000 hrs |
| Day 2 Post op | T—36.4, P—80, R—20, B/P—130/70: 1800 hrs |
| Day 3 Post op | T—36.8, P—88, R—20, B/P—130/70: 2200 hrs |

a) Suggest a reason that, on the day of her admission, Mrs Seagal’s vital signs were slightly elevated.

b) Suggest a reason why Mrs Seagal’s vital signs had decreased on the preoperative assessment.

c) What could you infer from the overall change in vital signs in the postoperative period?

d) What further objective and subjective data would you need to collect to confirm your assumptions?

10. Chart the above observations (in Q 9) on the Adult Deterioration Detection System chart (Figure 20.5). Identify if an escalation of care is required for this individual. If so, what type of escalation and why?

References


