Jarvis’s
PHYSICAL EXAMINATION & Health Assessment
Jarvis’s

PHYSICAL
EXAMINATION &
Health Assessment

Carolyn Jarvis, PhD, APN, CNP
Adjunct Associate Professor of Nursing
School of Nursing
Illinois Wesleyan University
Bloomington, Illinois

and

Family Nurse Practitioner
Chestnut Health Systems
Bloomington, Illinois

Australian Adapting Editors

Helen Forbes
RN, BAppSc (Adv Nurs)
(La Trobe University),
MEdStudies (Monash University),
PhD (University of Sydney)
Director of Teaching and Learning,
School of Nursing and Midwifery,
Deakin University, Victoria

Elizabeth Watt
RN, RM, Dip N (College of Nursing Australia),
BAppSc (Adv Nurs) (Lincoln Institute of Health
Sciences), MNS (La Trobe University),
Cert Prom Cont, FRCNA
Head, Clinical School of Nursing at
Austin Health, Division of Nursing & Midwifery,
La Trobe University, Victoria

Original illustrations by
Pat Thomas, CMI, FAMI
Oak Park, Illinois

Assessment photographs by
Kevin Strandberg
Professor of Art
Illinois Wesleyan University
Bloomington, Illinois
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National Library of Australia Cataloguing-in-Publication Data

Jarvis, Carolyn.
Jarvis’s physical examination and health assessment: ANZ adaptation / C. Jarvis; H. Forbes; E. Watt.

9780729539739 (pbk.)

Physical diagnosis—Handbooks, manuals, etc.
Nursing assessment—Handbooks, manuals, etc.

Forbes, H.
Watt, E.

616.0754

Publisher: Libby Houston
Developmental Editors: Larissa Norrie & Elizabeth Coady
Publishing Services Manager: Helena Klijn
Editorial Coordinators: Karen Griffiths & Lisa Shillan
Edited by Sybil Kesteven
Proofread by Tim Learner
Picture research by Copperleif & DW Stock Picture Library
Cover design by Lisa Petroff
Internal design by Midland Typesetters & Lisa Petroff
Index by Cynthia Swanson
Typeset by Midland Typesetters, Australia
Printed in China by tbc
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Carolyn Jarvis received her BSN cum laude from the University of Iowa, her MSN from Loyola University (Chicago), and her PhD from the University of Illinois at Chicago, with a research interest in the physiological effect of alcohol on the cardiovascular system. She has taught physical assessment and critical care nursing at Rush University (Chicago), the University of Missouri (Columbia), and the University of Illinois (Urbana), and she has taught physical assessment, pharmacology, and pathophysiology at Illinois Wesleyan University (Bloomington).

Dr Jarvis is a recipient of the University of Missouri’s Superior Teaching Award; has taught physical assessment to thousands of baccalaureate students, graduate students, and nursing professionals; has held 150 continuing education seminars; and is the author of numerous articles and textbook contributions. Dr Jarvis has maintained a clinical practice in advanced practice roles—first as a cardiovascular clinical specialist in various critical care settings and as a certified family nurse practitioner in primary care. She is currently an Associate Professor at Illinois Wesleyan University; is a nurse practitioner at Chestnut Health Systems, Bloomington, Illinois; and is licensed as an advanced practice nurse in the state of Illinois.
About the Australian adapting editors

Helen Forbes, RN, BAppSc (Adv Nurs) (La Trobe University), MEdStudies (Monash University), PhD (University of Sydney)

Elizabeth Watt, RN, RM, Dip N (College of Nursing Australia), BAppSc (Adv Nurs) (Lincoln Institute of Health Sciences), MNS (La Trobe University), Cert Prom Cont, FRCNA

Helen Forbes—Helen has a background in general adult acute care nursing as well as a focus on care of patients following head and neck surgery. She has extensive higher education experience and has held various teaching and leadership roles at both undergraduate and postgraduate levels over the past 25 years. Her current role is Director of Teaching & Learning at the School of Nursing & Midwifery, Deakin University, Melbourne. She has vast experience in curriculum design and development in nursing education.

Helen’s current teaching interests include clinical education, health assessment and adult acute care nursing. She has taught health assessment at undergraduate and postgraduate level for many years locally and internationally.

Elizabeth Watt—Liz has a background in adult acute care nursing and has also practised in both hospital and community-based midwifery. Her main clinical focus is in urological and continence nursing. She has over 25 years experience in higher education, teaching in undergraduate and postgraduate nursing programs. She is currently the Head, La Trobe University/Austin Health Clinical School of Nursing School of Nursing & Midwifery (Melbourne Campus). She has significant experience in curriculum development and implementation.

Liz’s current teaching interests include urological and continence nursing, health assessment, adult acute care nursing and clinical education. She has taught health assessment at undergraduate and postgraduate level for many years. Liz coordinates the undergraduate program at the clinical school and the postgraduate urological and continence nursing courses including the prostate care nurse program.
Australian and New Zealand contributors

Mari Botti  
PhD, GradDip Child Adolescent Psych, BA, RN, RM, MRCNA  
Professor, Faculty of Health, Deakin University  
Chair in Nursing, Epworth/Deakin Centre for Clinical Nursing Research, Deakin University, Victoria

Lucinda Brown  
MPubHlth, GradDip Hlth Sc, GradCert Allergy Nursing, RN  
Lecturer of Nursing, School of Nursing and Midwifery, Deakin University, Victoria

Rhonda Brown  
PhD, MSoSc, GradDip Family Therapy, GradDip Comm HLth, RN, RPN, MRCNA, MACMHN  
Senior Lecturer Mental Health  
School of Nursing and Midwifery, Faculty of Health, Deakin University, Victoria

Pauline Calleja  
RN, IPN, BNSc, MANP, MRCNA  
Lecturer  
Simulation Co-ordinator  
School of Nursing & Midwifery, Faculty of Health, Queensland University of Technology  
Vice President, Queensland Branch, College of Emergency Nursing Australasia

Julie Cochrane  
RN  
Clinical Manager, National Centre for Adult Stem Cell Research, Eskitis Institute, Griffith University, Nathan, Queensland

Dr Leonie Cox  
PhD, GC-HE, BA (Hons 1), RPN, ACMHN, RAI, AAS  
Lecturer, School of Nursing and Midwifery, Queensland University of Technology, Queensland

Rebecca Disler  
MSc, PDAN, BSc, RN  
Lecturer, Faculty of Nursing Midwifery and Health University of Technology Sydney, New South Wales

Pauline Glover  
EdD, MNS, BEd, DipT (NEd), RN, RM, FACM  
Associate Professor, Midwifery Course Coordinator, School of Nursing and Midwifery, Flinders University, South Australia

Ann Henderson  
PhD, MEdStud, DipBus, BEd, DipT, RN, RM, FRCNA, MACM  
Clinical Lecturer, School of Nursing, University of Adelaide, South Australia

Amy NB Johnston  
PhD, Dip Adult Ed, BSc(Hons), MEd  
Senior Lecturer, School of Nursing and Midwifery  
Research Fellow Eskitis Institute of Cell and Molecular Therapy, Griffith University, Queensland

Melanie Lauva  
RN, BNurs(Hons), GradCert HPEd, MEdRM  
Coordinator: Undergraduate Nursing  
School of Nursing, Midwifery and Postgraduate Medicine, Edith Cowan University, Western Australia

Maria Murphy  
PhD, GradDip Crit Care, GradCert Tert Ed, BN, MRCNA  
Lecturer, School of Nursing, La Trobe University, Melbourne  
Clinical Nurse Specialist, Department of Nursing, Austin Health, Melbourne, Victoria

Elizabeth Pascoe  
RN, Dip Nurs Ed (University of London), PG Dip Nurs (University of London), BSc(Hons) Nursing (Brunel University), MSc Nursing with Distinction (Brunel University)

Frances Pearce  
BHSc, RN, ONC, MPET  
Orthopaedic Educator Austin Health, Victoria

Alan Robins  
BA, RPN, GRAD DIP PVB POL, Med (Prel), MSW (Human Services Management), MHN, MACMHN, MRCNA, MANZPA, MIAGP

Dr Andrew Scanlon  
DNP, MN (Nurse Practitioner), MNS, GradDip Crit Care (Neuroscience), GradCert (Renal), BN, RN, MRCNA  
Lecturer, La Trobe University / Austin Health Clinical School of Nursing, Victoria

Sue Sharrad  
RN, BEd, Grad Dip Intensive Care, MNurs  
Lecturer, School of Nursing, The University of Adelaide, South Australia
Chris Taua  
MN(Dist), PGCHlthSc(MH), BN, RN, CAdTch, MNZCMHN  
Principal Lecturer, Faculty of Health and Science, School of Nursing and Human Services, Christchurch Polytechnic Institute of Technology, New Zealand

Karen Theobald  
PhD, BAppSc, GCert(Higher Ed), MHSc(Nursing), RN  
Senior Lecturer, Emergency Nursing Study Area Coordinator, School of Nursing & Midwifery, Queensland University of Technology, Queensland

Caroline Vafeas  
MA, PGCertEd, BSc(Hons), RGN, DN  
Postgraduate Coordinator; Gerontology & Dementia Studies, School of Nursing Midwifery and Postgraduate Medicine, Edith Cowan University, Western Australia

Chapter 3, Cultural Competence: Cultural Care  
Rachel E Spector  PhD, RN, CTN, FAAN

Chapter 7, Domestic Violence Assessment  
Daniel J Sheridan  PhD, RN, CNS, FNE-A, FAAN  
Shawna S Mudd  MSN, CRNP

Chapter 11, Nutritional Assessment  
Joyce K Keithley  DNSc, RN, FAAN

Chapter 28, Reassessment of the Hospitalised Adult  
Ian M Camera  MSN, ND, RN

Chapter 29, The Pregnant Female  
Deborah E Swenson  MSN, ARNP  
Promoting A Healthy Lifestyle feature boxes  
Martha Driessnack  PhD, ARNP
Australian and New Zealand reviewers

Julie Bowen-Withington
MA HlthSci (Nursing), BAppSci (Nursing), DipTchg (Tert), RN, RM, GradCert Family & Comm Hlth (Curtin), Family Planning Cert, Women’s Health Cert, CAT
Senior Nursing Lecturer
School of Nursing & Human Services, Te Matāpuna o Te Mātauraka, Christchurch Polytechnic Institute of Technology, New Zealand

Clare Cole
MEdSt, GradCert Nursing (Orthopaedics), BN, RN, MRCNA
Lecturer
School of Health Sciences, University of Ballarat, Victoria

Wendy Day
RN, MA
Nurse Educator (Lead) Practice Development, MidCentral Health, New Zealand

Martin Gadd
MNurs, GradCert Emergency, RN, BN
Lecturer
School of Health and Human Sciences, Southern Cross University, New South Wales

Mary V Huynh
RN, MEd, BAppSc (Adv Nurs)
Lecturer
School of Nursing & Midwifery, Victoria University, Victoria

Peter Lewis
BN, CertCC, MNEd, PhD
Senior Lecturer
School of Nursing and Midwifery, Queensland University of Technology, Queensland

Jan Liddell
RN, Dip Nsg, CAT, CATE
Academic Staff Member
Tihei Mauri Ora
Centre for Health and Social Practice, Waikato Institute of Technology, Hamilton, New Zealand

Lorna MacLellan
RN, SCM, MN, MNP
Convenor of Master of Nursing (Nurse Practitioner) Program
School of Nursing and Midwifery, University of Newcastle, New South Wales

Debbie Massey
Msc, BA(Hons), PGDE, RN
Lecturer
School of Nursing, Griffith University, Queensland

Claire Minton
RN, MN
Lecturer
School of Health and Social Services, Massey University, New Zealand

Rosemary Saunders
MPH, PGDipHlthProm, BAppSc, RN, MRCNA
Associate Professor, Course Coordinator—Master of Nursing Science
School of Population Health, Faculty of Medicine, Dentistry and Health Sciences, University of Western Australia

Sharyn Streitberg
MN, GradDip Ad Nur Prac (CritCare), BN
Lecturer, Specialty Stream Coordinator—Critical Care Nursing
1st year Coordinator—Bachelor of Nursing (Peninsula Campus)
Monash University, Victoria

Christine Wilson
RN, RM, Dip AppSc (Nursing), BH, Midwifery Cert, GradDip N Sc (ICU), GradCert N Sc (Retrieval), GradCert Ed
Flinders University, School of Nursing and Midwifery
Flinders Medical Centre, CN, ICCU, South Australia
Preface

Health assessment is central to nursing practice. By practising and developing the knowledge and skills of health assessment you will develop confidence in understanding and responding to each patient’s situation. You need to listen to the cues from your patients as these will guide and direct your questioning and physical examination. Whether you are an undergraduate nursing student, a newly qualified registered nurse or an experienced nurse seeking to advance your practice, this book holds the content you need to develop and refine your health assessment skills. The first edition of this text is contextualised to suit the Australian and New Zealand healthcare environments. We hope this text will become an invaluable part of your professional library and look forward to ongoing feedback from you, our readers.

NEW TO THE AUSTRALIAN AND NEW ZEALAND EDITION

The ANZ edition of Jarvis Physical Examination and Health Assessment has been fully revised and updated for the Australian and New Zealand contexts and structured to enhance learning for undergraduate and postgraduate students and clinicians.

Each chapter begins with an overview highlighting the importance and relevance of given topics to nursing practice. The introductory chapter describes the purpose of health assessment in nursing practice and how it contributes to a multidisciplinary patient assessment. All spelling, terminology, measurements, cultural and social considerations, clinical procedures and best practice reflect the Australian and New Zealand contexts.

- Updated table of contents to assist the reader to understand the relevance of the health assessment areas to the functional status of the person
- Each chapter contextualises the particular health assessment skills highlighting the importance and relevance of given topics to nursing practice
- New introductory chapter describes the purpose of health assessment in nursing practice and how this contributes to a multidisciplinary patient assessment
- New chapters on assessment of urinary and bowel function—key areas for nursing assessment in a variety of clinical settings including acute care, community health and aged care
- Each chapter has clearly identified health assessment skills for beginning and advanced clinicians.

DUAL FOCUS AS TEXT AND REFERENCE

Physical Examination & Health Assessment is a text for beginning students of health assessment as well as a text and reference for advanced practitioners. The chapter progression and format permit this scope without sacrificing one use for the other.

Chapters 1 to 5 focus on approaches and contexts of health assessment in nursing, including critical thinking, developmental tasks and health promotion for all age groups, cultural safety and screening for family violence and abuse.

Chapters 6 to 10 focus on health assessment tools and techniques, including the health interview and health history, physical assessment techniques, general survey, measurement vital signs and pain assessment.

Chapters 11 to 28 focus on the key areas for health assessment which are organised around functional areas relevant to nursing practice. Each chapter has five major sections: Structure and Function, Subjective Data (history), Objective Data (procedures and normal findings/abnormal findings and clinical alerts), Documentation and Critical Thinking and Abnormal Findings. The beginning nurse can review anatomy and physiology and learn the skills, normal findings and common variations for generally healthy people and selected abnormal findings in the Objective Data sections. They will also be prompted to report and refer clinically significant abnormal findings. The advanced practice nurse will be able to review anatomy and physiology and fundamental health assessment skills, while focusing on more the more complex knowledge and skills required for specialty nursing practice. Students can also study the extensive pathology illustrations and detailed text in the Abnormal Findings sections.

Chapters 29 and 30 focus on integrating health assessment in practice. Chapter 29 describes the complete health assessment using a head-to-toe approach for a complete screening examination in various age groups. Chapter 30 describes a more focused approach to assessment in response to a change in the patient’s condition.

CONCEPTUAL APPROACH

Physical Examination & Health Assessment reflects a commitment to:

- Holism, in the focus on the individual as a whole, both in wellness needs and illness needs
- Health promotion, in the health history questions that elicit self-care behaviours, the age-specific charts for periodic health examinations, the Promoting a Healthy Lifestyle boxes, and the self-examination teaching presented for skin, breast, testicles and nutrition
- Interacting with the person as an active participant in healthcare, by encouraging discussion of what the person currently is doing to promote health and by engaging the person to participate in self-care
• **Cultural considerations** that take into account the global society in which culturally diverse people seek healthcare

• Individuals across the life cycle, supported by the belief that a person’s state of health must be considered in light of developmental stage. Chapter 3 presents a baseline of developmental tasks and topics expected for each age grouping, and subsequent chapters integrate relevant developmental content. Developmental anatomy, modifications of history taking and examination technique, and expected findings are given for infants and children, adolescents, pregnant females, and ageing adults.

### FEATURES FROM EARLIER EDITIONS

*Physical Examination & Health Assessment* is built on the strengths of the previous US edition and is designed to engage students and enhance learning:

1. **The two-column format** begins in the Subjective Data section, where the running column highlights the rationales for asking history questions. In the Objective Data section, the running column highlights selected abnormal findings to show a clear relationship between normal and abnormal findings.

2. **Method of examination** (Objective Data section) is clear, orderly and easy to follow. Hundreds of original examination illustrations are linked directly with the text to demonstrate the physical examination in a step-by-step format.

3. **Abnormal Findings tables** organise and expand on material in the examination section. The atlas format of these extensive collections of pathology and original illustrations helps students recognise, sort and describe abnormal findings. When applicable, the text under a table entry is presented in a Subjective Data–Objective Data format.

4. **Developmental approach** in each chapter presents prototypical content on the adult, then age-specific content for the infant, child, adolescent, pregnant female and ageing adult so that students can learn common variations for all age groups.

5. **Cultural considerations** are extensive throughout and present the expected variations for culturally diverse people.

6. **Stunning full-colour art** shows detailed human anatomy, physiology, examination techniques and abnormal findings.

7. **Health history** (Subjective Data) appears in two places: In Chapter 7, The complete health history, and in pertinent history questions that are repeated and expanded in each regional examination chapter, including history questions that highlight health promotion and self-care. This presentation helps students understand the relationship between subjective and objective data. Considering the history and examination data together, as you do in the clinical setting, means that each chapter can stand on its own if a person has a specific problem related to that body system.

Chapter 6, The health assessment interview, has the most complete discussion available on the process of communication, interviewing skills, techniques and traps and cultural considerations.

8. **Summary checklists** towards the end of each chapter provide a quick review of examination steps to help develop a mental checklist.

9. **Focused assessment/clinical case studies** of frequently encountered situations show the application of assessment techniques to patients of different ages in differing clinical situations.

10. **Integration of the complete health assessment** for the adult is presented in Chapter 29. This approach integrates all the steps into a choreographed whole.

11. **User-friendly design** makes the book easy to use. Frequent subheadings and instructional headings assist in easy retrieval of material.

### SUPPLEMENTS

• The **EVOLVE Website** (located at http://evolve.elsevier.com/AU/Jarvis/) provides lecturers with PowerPoints and Test Banks for each of the 30 chapters, an Image Collection, and a **Student Lab Manual Answer Key**. Students have access to Appendices, Multiple Choice Review Questions, Quick Assessments for 20 Common Conditions and WebLinks—in effect, a comprehensive online resource that takes advantage of the dynamic nature of electronic content and online delivery.

• The **Pocket Companion for Physical Examination & Health Assessment** is a handy and current clinical reference that provides pertinent material in full colour and includes illustrations from the textbook.

• The **Student Laboratory Manual** is a workbook that includes a student study guide for each chapter, glossary of key terms, clinical objectives, regional write-up forms and review questions.

• **Health Assessment Online** is an innovative and dynamic teaching and learning tool featuring comprehensive Self-Paced Learning Modules, which offer increased flexibility to lecturers who wish to provide students with tutorial learning modules and in-depth case studies for each body system chapter in the text. Animations, sounds, images, interactive activities, and video clips are embedded in the learning modules and case studies to provide a dynamic, multimodal learning environment for today’s learners. **Health Assessment Online** also provides **Multiple Choice Review Questions** exclusive to Health Assessment Online and which align to the ANZ text.
ACKNOWLEDGMENTS

We would like to acknowledge the people who made the first Australian and New Zealand edition of this text possible:

- Vaughn Curtis, Elsevier Australia who at the time of commissioning this text was Australia’s Regional Director, for his initiative and support in establishing a team to make the adaption of this text possible.
- Luisa Cecotti, Libby Houston (Publishers) and Helena Klijn (Publishing Services Manager) for their support and persistence in keeping us on track.
- Larissa Norrie and Elizabeth Coady (Developmental Editors) for their support and keeping us organised and informed about the publishing process.
- Sybil Kesteven (Editor) for her outstanding attention to detail and for helping us to be better writers.
- Karen Griffiths and Lisa Shillan (Project Coordinators) for their efforts in transforming the manuscript into a textbook.

We would also like to thank our families for allowing us to take over our respective dining room table, computer and study over the past two and a half years. We thank them for their support and encouragement and for the endless cups of tea.

We would like to dedicate this edition to the nursing students and registered nurses who will use this text to develop their clinical skills. We encourage you to continually strive to develop and refine your health assessment skills. Your efforts will contribute to improving the patient/client experience and the overall quality and safety of nursing care.

The publisher and editors would like to also thank each of the chapter contributors and reviewers who ensured the relevance, accuracy and strong clinical application of the content. As an adaption of an existing text we would also like to acknowledge past contributors and reviewers who provided a strong foundation on which we could build.
Unit 1

Approaches and contexts of health assessment in nursing

Chapter One

The context of health assessment

Written by Helen Forbes and Elizabeth Watt

Assessment—point of entry in an ongoing process
What is health?
What is nursing?

http://evolve.elsevier.com/AU/Forbes/assessment

- Multiple review questions
- Appendices
- WebLinks
ASSESSMENT—POINT OF ENTRY IN AN ONGOING PROCESS

Assessment is the collection of data about an individual’s health state. Throughout this text, you will be studying the techniques of collecting and analysing subjective data (i.e. what the person says about themself during history taking) and objective data (i.e. what you as the health professional observe by inspecting, percussing, palpating and auscultating during the physical examination). Together with the patient’s record and laboratory studies, these elements form the database of the assessment of the person’s health.

From the database, you make a clinical judgment or diagnosis about the individual’s health state or response to actual or risk for health issues. Thus, the purpose of a health assessment is to make a judgment or diagnosis. Because all healthcare treatments and decisions are based on the data gathered during assessment, it is paramount that the assessment be factual and complete, providing the foundation for clinical decision making. Chapter 2 provides more detail about the process of clinical decision making that requires critical thinking and health assessment.

WHAT IS HEALTH?

Assessment is the collection of data about an individual’s health state. Therefore, a clear idea of health is important because this determines which assessment data should be collected. In general, the list of data that must be collected has lengthened as our concept of health has broadened. The World Health Organization (WHO) (2001) defines health as ‘a state of complete physical, mental, and social well-being and not merely the absence of disease, or infirmity’. While this is a broad definition it is important to recognise that health is an emerging state and is not merely the absence of disease. In order to achieve an adequate quality of life in later years, actively promoting good health is vital throughout life.

The situations in which people are born, grow, live and play have an important role in determining health. The WHO (2008) states: ‘The social determinants of health are the conditions in which people are born, grow, live, work and age, including the health system. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels, which are themselves influenced by policy choices. The social determinants of health are mostly responsible for health inequities—the unfair and avoidable differences in health status seen within and between countries.’

Therefore, conducting health assessment on a person requires acknowledgment of both the social and the environmental context in which they live. For example, consider the discharge needs of a homeless young male patient following a motor cycle accident. How could his wound care and nutritional needs be managed in the community context if he has no fixed address?

Models of health

The social model of health acknowledges the effect of social, economic, cultural and political factors and conditions on a person’s state of health and wellbeing. Use of the model aims to improve health outcomes, prevent and reduce illness and address the inequalities and disadvantage that exist within the community. Community healthcare, as a part of primary healthcare, is informed by the values and principles supported in the Alma-Ata Declaration on Primary Health Care (World Health Organization, 1978) and the Ottawa Charter for Health Promotion (WHO, 1986).

The social model of health recognises:

- The social, economic and environmental determinants of health and illness
- The importance of health promotion and disease prevention
- The importance of community participation in decision making
- The importance of working with sectors outside the health sector
- That equity is an important outcome of health service intervention.

The biomedical model of Western tradition views health as the absence of disease. Health and disease are opposites, extremes on a linear continuum. Disease is caused by specific agents or pathogens. Thus, the biomedical focus is the diagnosis and treatment of those pathogens and the curing of disease. Assessment factors are a list of biophysical symptoms and signs. The person is certified as healthy when these symptoms and signs have been eliminated. When disease does exist, medical diagnosis is worded to identify and explain the cause of disease.

The accurate diagnosis and treatment of illness is an important part of healthcare but the medical model has limiting boundaries. The public’s concept of health has expanded since the 1950s. Now we view health in a wider context. We have an increasing interest in lifestyle, personal habits, exercise and nutrition, and the social and natural environment. Wellness is a dynamic process, a move towards optimal functioning. Different levels of wellness exist, with optimal health described as ‘high-level wellness’. Wellness is a direction of progress. Healthcare providers serve to maximise the person’s potential, to assist the person to grow towards high-level wellness.

Consideration of the whole person is the essence of holistic health. Holistic health views the mind, body and spirit as interdependent and functioning as a whole within the environment. Health depends on all these factors working together. The basis of disease is multifaceted, originating both from within the person and from the external environment. Thus, the treatment of disease requires the services of numerous providers.

A natural progression to health promotion and disease prevention now rounds out our concept of health. Guidelines to prevention emphasise the link between health and personal behaviour. Reports from the Department of Health and Ageing, Australian Government (2009) and the New Zealand Public Health Advisory Committee (2006) assert that the majority of deaths among Australians and New Zealanders under age 65 are preventable. Prevention can be achieved through counselling by primary care providers which is
designed to change people’s unhealthy behaviours related to smoking, alcohol and other drug use, lack of exercise, poor nutrition, injuries and sexually transmitted infections. Health promotion is a much broader concept than disease prevention. Health promotion was defined in the Ottawa Charter for Health Promotion (WHO) (1986) and includes building public health policy, creating supportive environments for healthy living, strengthening community action, developing personal knowledge and skills and reorienting the healthcare system (Talbot and Verinder, 2010).

WHAT IS NURSING?

The International Council of Nurses (ICN) states that nursing includes ‘collaborative care of individuals of all ages, families, groups and communities, sick or well and in all settings. Nursing includes the promotion of health, prevention of illness, and the care of ill, disabled and dying people . . .’ (ICN, 2010). This implies that the nursing approach to healthcare is holistic in nature and therefore health assessment should reflect that philosophy with its focus on the whole person and their context.

There are a range of clinical contexts in which you may work as a nurse. These include community health settings, mental healthcare, acute and critical care contexts, remote and rural settings, rehabilitation or residential aged care. The nature of the context will usually determine the type and focus of health assessment required. In the community you may focus on assessing an individual, a family or a community and be interested in gathering information about wellness as opposed to illness. In an acute setting, whether it is in critical care or more general ward areas, your focus will be a little different. Patient problems may vary across the treatment trajectory, which means that you will time and focus your health assessment accordingly.

In the provision of care, nurses and midwives are ethically responsible and accountable to the recipient of care (ICN, 2006). From an ethical point of view it is expected that nurses and midwives will respect, promote, protect and uphold the rights of people either receiving care or providing healthcare. The nursing and midwifery codes of ethics outline minimum national standards of conduct that members of the professions are expected to uphold. These codes inform the community of the standards of professional conduct it can expect nurses and midwives to uphold and provide the consumer, regulatory, employing and professional bodies with a basis for evaluating their professional conduct. The Australian Nursing & Midwifery Council code of professional conduct provides guidelines about expected behaviour of nurses and midwives. Nurses and midwives are expected to conduct their practice using exemplary standards of behaviour. In summary, it is expected that each professional will be safe and competent and practise in accordance with the standards of nursing and the broader health system. Nurses must conduct their practice according to laws relevant to nursing. Nurses and midwives are also legally responsible for their practice and answerable to the professional registering body (Australian Health Practitioner Regulation Agency, 2010; Nursing Council of New Zealand, 2010). All nurses and midwives in Australia and New Zealand must demonstrate competence in a range of domains, one of which relates to the conduct of comprehensive and systematic nursing health assessment (Australian Nursing & Midwifery Council, 2006a; Nursing Council of New Zealand, 2007). Advanced practice nurses, for example nurse practitioners, also have legal requirements for competence in their specialist area related to advanced health assessment (Australian Nursing & Midwifery Council, 2006b; Nursing Council of New Zealand, 2008). (See bibliography for references to the relevant codes of ethics and professional conduct for nurses and midwives in Australia and New Zealand.)

Quality and safety

Once a person accesses the healthcare system for treatment of illness, a number of factors pose potential risk for harm. Examples include increasing age, comorbidity and the increasing use of complex technology, the use of numerous and complex interventions during an episode of illness, movement between community and hospital health sectors giving rise to possible duplication of, or gaps in, care and/or communication breakdown. The Australian Charter of Healthcare Rights describes the rights of patients and other people using the Australian health system. One of the principles of this Charter recognises that every person has the right to the highest standard of care (Australian Charter of Healthcare Rights, 2008). While the solutions to decreasing risk to the person are complex, improving the use, availability and communication of health information is critical to the provision of high quality and safe care (The Australian Commission on Safety and Quality in Healthcare, 2009). Quality and safe care of patients and clients requires that nurses assess in order to determine care needs. Assessment is conducted in collaboration with the patient and the multidisciplinary healthcare team to achieve positive goals and health outcomes for the recipient of care.

Life span considerations

It is important to consider health assessment from a life cycle approach, no matter what clinical context you are working in. First, you must be familiar with the usual and expected developmental tasks for each age group (Ch 3). This alerts you to which physical, psychosocial, cognitive and behavioural tasks are important for each person. For example, if you are assessing a 6-year-old child with asthma, your approach will need to take into account the developmental tasks for that child’s age group which include mastering skills that will be needed later as an adult, building self-esteem and a positive self-concept, adopting moral standards and taking a place in a peer group. This knowledge will guide you approach the collection of subjective and objective data. The data from the physical examination is more accurate when you consider age-specific information about anatomy, method of examination, normal findings and abnormal findings. For example, an average normal respiratory rate for a 6-year-old child is 21–26 breaths per minute.
Cultural and social considerations
The population of Australia is in excess of 22 million; New Zealand in excess of 4 million. The Australian community now includes people from about 200 countries (Department of Foreign Affairs & Trade, 2009). Similarly, the New Zealand population includes people from over 145 countries (Department of Immigration, 2005). As mentioned above, cultural and social considerations are critical to health assessment: there is an introduction to these concepts in Chapter 3 and the concepts are threaded throughout the text as they relate to specific chapters.

BIBLIOGRAPHY


Health Practitioner Regulation National Law Act 2009


The ICN definition of nursing, 2010. Available at http://www.icn.ch/definition.htm


New Zealand College of Midwives: Code of ethics, nd. Available at http://www.midwife.org.nz/index.cfm/1,179,530,0,html/Code-of-Ethics


Websites


Tanner C: Thinking like a nurse: a research-based model of clinical judgment in nursing, *Journal of Nursing Education* 45(6), 204–211, 2006.

**Websites**

Unit 5
Assessing musculoskeletal function

Chapter Fifteen
Musculoskeletal system

Written by Carolyn Jarvis
Adapted by Fran Pearce

Introduction

Structure and function
Components of the musculoskeletal system

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Health history questions

Objective data
Gait Arms Legs and Spine (GALS) screening assessment
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INTRODUCTION

The musculoskeletal system is a vast organ system that provides locomotion, and an upright posture and protection for the body. It is composed of various forms of connective tissue which include bones, skeletal muscle, cartilage, ligaments, tendons and joints. In order to appreciate the impact of disease and trauma to this complex and dynamic system you are advised to first review the structure and function of bones, skeletal muscle, cartilage, ligaments, tendons and joints.

STRUCTURE AND FUNCTION

The musculoskeletal system has both structural and metabolic functions. Its structural function is essential for locomotion, respiration and the protection of internal organs and the central nervous system. The marrow within bones contains critical components of the haematopoietic and immune system. The bone marrow produces B cells, granulocytes and immature thymocytes, in addition to red blood cells and platelets.

Its metabolic function is as a storehouse for calcium, phosphorus and carbonate, and as a buffering system in hydrogen ion concentration. Bone plays a major role in conjunction with the renal system in blood calcium level regulation (Barnato and Sprague, 2009). The enormous mineral surface of the skeleton can also bind toxins and heavy metals, minimising their ability to cause cellular damage.

COMPONENTS OF THE MUSCULOSKELETAL SYSTEM

Bone

Bone is a mineralised connective tissue consisting of cells embedded in a protein matrix of collagen, alkaline phosphatase and osteopontin. This dynamic tissue responds to mechanical stresses through a complex process of remodelling. The remodelling process involves the resorption of micro-damaged bone by osteoclast cells followed by a phase of bone formation by osteoblast cells. In healthy adults this process is coupled to ensure bone density remains stable. Gonadal steroid hormones, parathyroid hormone and various growth factors have been shown to affect this process, indicating a central regulatory mechanism (Karsenty, 2000). When this process becomes uncoupled, normal bone density is altered, leading to a change in the normal architecture of bone seen in diseases such as osteoporosis (Seeman et al, 2006), and Paget’s disease (Matthews and Cundy, 2009).

Cartilage

This connective tissue is a firm gel-like substance characterised by resilience and the ability to absorb mechanical forces. The human body contains three major types of cartilage: hyaline cartilage, elastic cartilage and fibrocartilage. Hyaline cartilage is the most common type of cartilage found in parts of the respiratory tract and on joint surfaces. Within joints, articular cartilage protects the joint by distributing applied loads, and by providing a low-friction-bearing surface to maximise movement. Fibrocartilage is found in the intervertebral discs, menisci of the knee joint and the symphysis pubis. Its structure provides resistance to the compression and shearing forces within these joints. All types of cartilage are avascular and aneural, therefore tears in cartilage cannot heal.

Ligaments and tendons

Ligaments and tendons are connective tissues with complex biomechanical properties. Ligaments connect bone to bone and tendons connect muscles to bone. Injury to a ligament or tendon results in a drastic change in structure, resulting in the formation of scar tissue that is biomechanically inferior. For example, repair of the anterior cruciate ligament (ACL) in the knee requires a new piece of tissue graft from a hamstring muscle. The resultant graft does not possess the same qualities of strength and stability as the original ACL.

Muscles

There are three types of muscle in the human body: smooth, cardiac and skeletal muscle. Skeletal muscles are innervated by the motor nerve fibres of peripheral nerves. Conscious and subconscious contractions of muscles affect posture and locomotion and also generate reflexes. The human body contains over 400 skeletal muscles representing 40–50% of total body weight. A whole skeletal muscle is considered an organ of the muscular system. Skeletal muscle fibres have an abundant blood and nerve supply and are bundled together in a compartment wrapped in a tough fibrous connective tissue called fascia.

Diseases and disorders of the muscular system are diverse and include infections, hormonal, genetic and autoimmune disorders and malignancies. Minor traumatic injuries are the most common disorders of the muscular skeletal system. When major injury to muscles occurs as in limb trauma, intracompartmental tissue pressure can quickly rise. A rise in intracompartmental tissue pressure is known as compartment syndrome. This syndrome is characterised by muscle necrosis called rhabdomyolysis. Rhabdomyolysis ultimately leads to the release of cellular contents—including myoglobin into the circulatory system. This may result in potential life-threatening complications including myoglobinuric acute renal failure, hyperkalaemia and cardiac arrest (Malik et al, 2009; Rupert, 2002).
Joints

Joints are the functional units of the skeleton. Individual joints are described and classified by two qualities—the structure of the joint and the range of movement permitted by the joint.

Classification of joints by range of movement

Diarthroses—moveable joints
Synarthroses—immovable joints
Amphiarthroses—‘mixed’ joints of limited movement

Classification of joints by structure

Fibrous (synarthrotic) joints. The articulating bones are joined by fibrous connective tissue; for example, the joints (sutures) of the skull bones.
Cartilaginous (amphiarthrotic) joints. The articulating bones are joined by cartilage; for example, the pubic symphysis.
Synovial (diarthrotic) joints. These are freely mobile joints characterised by a joint cavity lined with synovial tissue and supported by ligaments, tendons and bursae (Fig 15.1).

Synovial joints may be also sub-classified according to the type of movement that they permit; for example, the ball and socket joint of the hip and hinge joint of the knee.

Each joint reflects a compromise between stability and range of motion. The bones of the skull, for example, are stable but immobile, whereas the shoulder joint allows for a full range of motion but is a relatively unstable joint.

Movement of joints involving muscle contraction produces the following patterns of motion (Fig 15.2):

1. Flexion—bending a limb at a joint
2. Extension—straightening a limb at a joint
3. Abduction—moving a limb away from the midline of the body
4. Adduction—moving a limb towards the midline of the body
5. Pronation—turning the forearm so that the palm is down
6. Supination—turning the forearm so that the palm is up
7. Circumduction—moving the arm in a circle around the shoulder
8. Inversion—moving the sole of the foot inwards at the ankle
9. Eversion—moving the sole of the foot outwards at the ankle
10. Rotation—moving the head around a central axis
11. Protraction—moving a body part forwards and parallel to the ground
12. Retraction—moving a body part backwards and parallel to the ground
13. Elevation—raising a body part

Joint anatomy

Temporomandibular joint. The temporomandibular joint (TMJ) is the articulation of the mandible and the temporal bone (Fig 15.3). The TMJ permits jaw function for speaking and chewing. The joint allows three motions: (1) hinge action to open and close the jaws, (2) gliding action for protrusion and retraction and (3) gliding for side-to-side movement of the lower jaw.

Spinal column. The vertebrae are 33 connecting bones stacked in a vertical column (Fig 15.4). The spinous processes can be palpated as a furrow down the midline of the back. The furrow has paravertebral muscles moulded on either side down to the sacrum, where it flattens. Humans have 7 cervical, 12 thoracic, 5 lumbar, 5 sacral and 3 or 4 coccygeal vertebrae. The following surface landmarks will orient you to their levels:

- The spinous processes of C7 and T1 are prominent at the base of the neck.
The radius and ulna articulate with each other at two radioulnar joints, one at the elbow and one at the wrist. These move together to permit pronation and supination of the hand and forearm.

**Wrist and carpals.** Of the body’s 206 bones, over half are in the hands and feet. The wrist or **radiocarpal joint** is the articulation of the radius (on the thumb side) and a row of carpal bones (Fig 15.10). Its condyloid action permits movement in two planes at right angles: flexion and extension, and side-to-side deviation. The groove of this joint can be palpated on the dorsum of the wrist.

The **midcarpal joint** is the articulation between the two parallel rows of carpal bones. It allows flexion, extension and some rotation. The **metacarpophalangeal** and the **interphalangeal** joints permit finger flexion and extension. The flexor tendons of the wrist and hand are enclosed in synovial sheaths.

**Hip.** The hip joint is the articulation between the acetabulum and the head of the femur (Fig 15.11). As in the shoulder, ball-and-socket action permits a wide range of motion on many axes. The hip has somewhat less range of motion (ROM) than the shoulder, but it has more stability as befits its weight-
bearing function. Hip stability is due to powerful muscles that spread over the joint, a strong fibrous articular capsule and the very deep insertion of the head of the femur. Three bursae facilitate movement.

Palpation of these bony landmarks will guide your examination. You can feel the entire iliac crest, from the \textit{anterior superior iliac spine} to the posterior. The \textit{ischial tuberosity} lies under the gluteus maximus muscle and is palpable when the hip is flexed. The \textit{greater trochanter} of the femur is normally the width of the person’s palm below the iliac crest and halfway between the anterior superior iliac spine and the ischial tuberosity. This landmark is best palpated when the person is standing, in a flat depression on the upper lateral side of the thigh.

\textbf{Knee.} The knee joint is the articulation of three bones—the femur, the tibia and the patella (kneecap)—in one common
midline. Move to the sides and superiorly and note the lateral
and medial condyles of the tibia. Superior to these on either
side of the patella are the medial and lateral epicondyles of
the femur.

**Ankle and foot.** The ankle or **tibiotalar joint** is the articu-
ation of the tibia, fibula and talus (Fig 15.14). It is a hinge
joint, limited to flexion (dorsiflexion) and extension (plantar
flexion) on one plane. Landmarks are two bony prominences
on either side—the **medial malleolus** and the **lateral malleo-
lus**. Strong, tight medial and lateral ligaments extend from
each malleolus onto the foot. These help the lateral stability
of the ankle joint, although they may be torn in eversion or
inversion sprains of the ankle.

Joints distal to the ankle give additional mobility to the
foot. The subtalar joint permits inversion and eversion of
the foot. The foot has a longitudinal arch, with weight-bearing
distributed between the parts that touch the ground—the
heads of the metatarsals and the calcaneus (heel).

**DEVELOPMENTAL CONSIDERATIONS**

**Infants and children**

By 3 months gestation, the fetus has formed a ‘scale model’
of the skeleton that is made up of cartilage. During succeed-
ning months in utero, the cartilage ossifies into true bone and
starts to grow. Bone growth continues after birth—rapidly
during infancy and then steadily during childhood—until
adolescence, when both boys and girls undergo a rapid
growth spurt.

Long bones grow in two dimensions. They increase in
width or diameter by deposition of new bony tissue around
the shafts. Lengthening occurs at the epiphyses, or growth
plates. These specialised growth centres are transverse discs
located at the ends of long bone. Any trauma or infection at
this location puts the growing child at risk for bone defor-
mity. This longitudinal growth continues until closure of the
ejephyses; the last closure occurs at about age 20 years.

Skeletal contour changes are apparent at the vertebral
column. At birth the spine has a single C-shaped curve. At
3 to 4 months, raising the baby’s head from prone position
develops the anterior curve in the cervical neck region. From
1 year to 18 months, standing erect develops the anterior
curve in the lumbar region.

Musculoskeletal conditions seen in the neonatal period
include developmental dysplasia of the hip (DDH), talipes
equinovarus (clubfoot) and upper and lower limb develop-
ment deformities.

The term developmental dysplasia of the hip (DDH)
describes a wide range of hip abnormalities found within the
neonatal period in which the femoral head has an abnormal
relationship to the acetabulum. Variances in these disorders
range from stable hips with acetabular dysplasia to complete
displacement of the femoral head out of an abnormal
acetabulum. The prevalence of DDH varies due to diagnostic
criteria, examiner skills and disorder progress. Minor hip
dysplasia often resolves spontaneously (Hart et al, 2006). The
incidence in Australia is cited as ≥19 per 1000 births (Goss,
2002). Successful clinical DDH screening programs within
Australia using midwives, maternal child health nurses and
primary care clinicians have been created since the 1960s in order to eliminate ‘late diagnosed’ DDH. Untreated DDH has the potential to prevent long-term hip dysplasia and arthritis. Ultrasound imaging can be a valuable adjunct to the physical examination and a means of monitoring treatment in those high-risk infants—breech presentation, familial history of DDH, structural foot deformity or infants suffering a neuromuscular disease (Green and Oddie, 2008).

Musculoskeletal conditions, however, are evident throughout childhood, affecting up to 30% of children and adolescents. The majority are self-limiting, and often trauma related. These conditions also include life-threatening disorders such as malignant disease and infection (Foster and Kimura, 2009). Chronic musculoskeletal conditions include a spectrum of autoimmune/inflammatory joint and muscle disorders. An estimated 4600 Australian children in 2004–05 had arthritis (AIHW, 2008a). Juvenile arthritis affects the child’s growth and musculoskeletal development. The associated disability and chronic pain symptoms impacts on all aspects of the child’s life and family dynamics.

The pregnant female

It has been reported that almost all women experience some degree of musculoskeletal discomfort during pregnancy and 25% have at least temporarily disabling symptoms with low back pain cited as the most common complaint (Borg-Stein and Dugan, 2007).

Increased levels of circulating hormones (oestrogen, relaxin from the corpus luteum and corticosteroids) cause increased mobility in the joints. Increased mobility in the sacroiliac, sacrococcygeal and symphysis pubis joints in the pelvis contributes to the noticeable changes in maternal posture. The most characteristic change is progressive lordosis, which compensates for the enlarging fetus; otherwise, the centre of balance would shift forwards. Lordosis compensates by shifting the weight further back on the lower extremities. This shift in balance in turn creates strain on the low back muscles, which in some women is felt as low back pain during late pregnancy.

Anterior flexion of the neck and slumping of the shoulder girdle are other postural changes that compensate for the lordosis. These upper back changes may put pressure on the ulnar and median nerves during the third trimester. Carpal tunnel syndrome, for example, has a reported incidence of up to 25%. It is more common in older pregnant women with generalised oedema. Carpal tunnel syndrome found in association with pregnancy almost always resolves within 4 weeks of delivery (Van Slobbe et al, 2004).

Effects of pregnancy on preexisting musculoskeletal conditions

Pregnancy and the associated changes in circulating hormones and postural changes impact on a diverse range of preexisting musculoskeletal conditions. Examples include remission rates up to 75% of women with preexisting rheumatoid arthritis who become pregnant. The remission often continues until approximately 6 weeks postpartum, commonly followed by an exacerbation of symptoms. The exact aetiology of this remission is unknown (De Man et al, 2008). Knowledge of the effects of pregnancy on the musculoskeletal system is vital to ensure patients with preexisting conditions receive effective counselling and support during pregnancy.

Late adulthood (65+ years)

With ageing, loss of bone matrix (resorption) occurs more rapidly than new bone growth (deposition). The net effect is a loss of bone density, or osteoporosis. While the age-adjusted incidence of osteoporotic hip fracture in Australia appears to have decreased over recent years, the actual number of cases has increased in both sexes when population growth and the proportion of older people are taken into account. 2.2 million Australians have an osteoporosis related condition—this will become 3 million by 2021 with 1.65 million women and 0.51 million men affected (AIHW, 2008b). (See also ‘Promoting a healthy lifestyle: osteoporosis—“the silent disease”’ below.)

Postural changes are evident with ageing, and decreased height is the most noticeable. Long bones do not shorten with age. Decreased height is due to shortening of the vertebral column. This is caused by the gradual loss of water and associated thinning of the intervertebral discs. Both men and women can expect a progressive decrease in height beginning at age 40 years in males and age 43 years in females, although this decrease is not significant until age 60 years. A greater decrease occurs in the 70s and 80s as a result of osteoporotic collapse of the vertebrae. The result is a shortening of the trunk and comparatively long extremities. Other postural changes are kyphosis, and a backwards head tilt to compensate for the kyphosis, and a slight flexion of hips and knees.

The distribution of subcutaneous fat changes through life. Usually, men and women gain weight in their 40s and 50s. The contour is different, even if the weight is the same as when younger. They begin to lose fat in the face and deposit it in the abdomen and hips. In the 80s and 90s, fat further decreases in the periphery, which is especially noticeable in the forearms and apparent over the abdomen and hips. Loss of subcutaneous fat leaves bony prominences more marked (e.g. tips of vertebrae, ribs, iliac crests) and body hollows deeper, for example, cheeks and axillae.

An absolute loss in muscle mass occurs; some muscles decrease in size, and some atrophy, producing weakness. The contour of muscles becomes more prominent, and muscle bundles and tendons feel more distinct.

It has become more apparent that lifestyle affects musculoskeletal changes. A sedentary lifestyle hastens the musculoskeletal changes of ageing. High-impact exercise may increase bone strength and reduce hip fragility fractures, but research indicates that exercise needs to be performed frequently for an optimal response (Bailey and Brooke-Wavell, 2010).

The musculoskeletal changes and the associated musculoskeletal degenerative diseases have a major impact on the older person’s safety. Gait pattern changes include slowing down and shorter stride length (Moc et al, 2007). Every year, approximately 30% of Australians over 65 years old fall,
Musculoskeletal conditions affect over one-third of the Australian population and represent some of the most common causes of pain and disability (ABS, 2006; AIHW, 2008a). The most common musculoskeletal conditions affecting Australians include arthritis, back pain and osteoporosis (ABS, 2006). Since 2002, arthritis and related musculoskeletal conditions have been an Australian National Health Priority Area (ABS, 2006).

This situation is evident globally with musculoskeletal conditions identified as being among the world’s leading causes of long-term pain and disability. The impact of musculoskeletal conditions includes chronic pain, deformity, mobility restriction and functional impairment, as well as affecting mental health and quality of life (Lidgren, 2003). Musculoskeletal conditions impact on families, and society in general, through reduced social interaction, role restrictions, lost productivity and the significant cost of ongoing management and treatment (WHO, 2004).

Road trauma represents a leading cause of traumatic musculoskeletal injury worldwide. In 2001, 495,300 Australians reported a long-term condition caused by a road trauma (ABS, 2003). Over 60% of road trauma victims were adults under 40 years of age (DoITRD, 2009). Sequelae include not only physical and functional impairments such as chronic pain and joint disorders, but also a range of psychological and social problems (Donaldson et al, 2009).

Indigenous Australian males are twice as likely to have a hip fracture as other Australian males, whereas Indigenous females are 26% more likely to have a hip fracture than other Australian females. Indigenous Australians are on average much younger than other Australians at the time of their hip fracture, aged 65 years (compared with 81 years) for males and 74 years (compared with 83 years) for females (AIHW, 2010b). Chronic musculoskeletal diseases and trauma statistics for Indigenous Australians are incomplete. However, higher incidence of smoking, excessive alcohol consumption, poor diet and obesity combined with major deficits in preventative healthcare programs would suggest a likely increased incidence of hip fracture in the future (AHMAC, 2006). (Refer to Ch 4 for further discussion of cultural considerations in health assessment.)

**CULTURAL AND SOCIAL CONSIDERATIONS**

Musculoskeletal conditions affect over 10% of the Australian population and represent some of the most common causes of pain and disability (ABS, 2006; AIHW, 2008a). The most common musculoskeletal conditions affecting Australians include arthritis, back pain and osteoporosis (ABS, 2006). Since 2002, arthritis and related musculoskeletal conditions have been an Australian National Health Priority Area (ABS, 2006).

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**SUBJECTIVE DATA**

**General principles**

As noted previously, musculoskeletal disorders cause pain, stiffness and impairment to activities of daily living.

A comprehensive musculoskeletal assessment should be integrated into a patient’s health assessment as numerous general health issues and prescribed medications affect this system. For example, chronic heart and lung disease impacts on mobility. Visual deficits, Vitamin B12 deficiency and incontinence all increase falls risks.

Musculoskeletal assessment is a systematic process involving application of knowledge of functional anatomy, and the mechanisms of injury and disease across the life span. As nursing roles expand within Australia, it is often the nurse who has the first point of contact with the person in both community and hospital settings.

This assessment process involves initially allowing the patient to tell their story, through history taking, of the impact of their joint dysfunction and pain on their lives. Due to the often chronic nature of musculoskeletal disorders it is important to ask about previous complementary therapies, non-prescription medications and remedies. A thorough history will assist in identifying the nature of the musculoskeletal problems; for example, acute injury, degenerative, inflammatory, infective or malignant disorders.

A current medical history including medications is an essential part of musculoskeletal assessment. A variety of endocrine/metabolic disorders, nutritional conditions and medications can impact on bone health. Diseases such as hyperthyroidism, diabetes, renal disease, malabsorption syndromes and glucocorticoids, loop diuretics and aluminium are the most common risk factors (Hansberger, 2006). There is also a strong genetic link associated with musculoskeletal health so the patient should be asked to discuss any family history of fractures or arthritis (Giangregorio and Leslie, 2010).

As the musculoskeletal system is closely linked with the neurological system, it is suggested you refer to Chapter 22. As acute and chronic pain is also often associated with musculoskeletal disorders it is suggested you refer to Chapter 10.
Assessment components

1. Gait, arms, legs and spine (GALS) screening assessment
2. Joints
   - Pain
   - Stiffness
   - Swelling, heat, redness
   - Limitation of movement
3. Muscles
   - Pain (cramps)
   - Weakness
4. Bones
   - Pain
   - Deformity
   - Trauma (fractures, sprains, dislocations)
5. Functional assessment (activities of daily living (ADLs))
6. Self-care behaviours

Subjective data

Assessment guidelines

1. **Gait Arms Legs and Spine (GALS) screening assessment**
   A screening musculoskeletal examination can rapidly identify those people who require comprehensive musculoskeletal assessment. The Gait Arms Legs and Spine (GALS) screening assessment is a highly sensitive, specific and well-validated screening assessment for the detection of joint abnormalities (ARC, 2005; Doherty, 1992; Lillicrap et al, 2003). Subjective data from this screening assessment involves 3 core questions.

   ‘Have you any pain or stiffness in your muscles, joints or back?’
   ‘Can you dress yourself completely without any difficulty?’ and
   ‘Can you walk up and down stairs without any difficulty?’

   Positive responses indicate a detailed history should be taken. A paediatric-specific GALS assessment has also proved highly sensitive, specific and well-validated (ARC, 2005; Foster et al, 2006).

2. **Joints.**
   - Any problems with your joints? Tell me about your pain?
   - Location: Which joints? On one side or both sides?
   - Quality: What does the pain feel like: aching, stiff, sharp or dull, shooting?
   - Severity: How strong is the pain?
   - Onset: When did this pain start?
   - Timing: What time of day does the pain occur? How long does it last? How often does it occur?
   - Is the pain aggravated by movement, rest, position, weather? Is the pain relieved by rest, medications, application of heat or ice?

Joint pain and loss of function are the most common musculoskeletal concerns that prompt a person to seek care.

Rheumatoid arthritis (RA) involves symmetrical joints; other musculoskeletal illnesses and trauma involve isolated or unilateral joints.

Exquisitely tender felt with acute inflammation.

Chronic pain is often associated with degenerative musculoskeletal disorders.

RA pain is worse in morning when arising; osteoarthritis is worse later in the day; tendinitis is worse in morning, improves during the day.

Most joint pain is mechanical except in RA, when deformities restrict movement. Many patients have tried prescribed medications, homeopathic remedies, over-the-counter (OTC) medications or combination formulations. These need to be identified and included in your assessment.
### Assessment guidelines

- Is the pain associated with chills, fever, recent sore throat, trauma and repetitive activity?
- Any stiffness in your joints?
- Any swelling, heat, redness in the joints?
- Any limitation of movement in any joint? Which joint?
- Which activities give you problems? (See Functional assessment below)

### Clinical significance and clinical alerts

Joint pain 10 to 14 days after an untreated strep throat suggests rheumatic fever. Joint injury occurs from trauma or repetitive motion.

RA stiffness occurs in morning and after rest periods.

Suggests acute inflammation.

Decreased ROM may be due to joint disease or to muscle contracture.

Myalgia is usually felt as cramping or aching.

Suggests intermittent claudication (Ch 11).

Viral illness often includes myalgia.

Weakness may involve peripheral vascular system or neurological systems (Chs 11 and 22).

Smaller muscles indicate atrophy. Swelling may indicate haematoma or tumour.

Trauma causes sharp pain that increases with movement. Other bone pain usually feels ‘dull’ and ‘deep’ and is unrelated to movement.

Injury to ligaments affects joint kine-
matics, e.g. whiplash trauma may result in cervical ligament laxity and chronic pain syndromes.

Previous joint trauma increases risk of degenerative arthritis.

Many patients with back pain have sought treatments provided by physio-
therapists, chiropractors, osteopaths or acupuncturists.

The aetiology is diverse, i.e. degenera-
tive or traumatic conditions of the spine, fibrositis, inflammatory spondyloarthrop-
athy and metabolic bone conditions are also cited as causes.

Spinal nerve-root dysfunction is associ-
ated with altered sensory and motor function. See Chapter 22.

Functional assessment screens the safety of independent living, the need for community supports and quality of life.

Degenerative lower limb joint dysfunction affects mobility and steppage and increases risk of falls. Upper limb nerve compression affects precision and grip, e.g. carpal tunnel syndrome.

<table>
<thead>
<tr>
<th>Assessment guidelines</th>
<th>Clinical significance and clinical alerts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the pain associated with chills, fever, recent sore throat, trauma and repetitive activity?</td>
<td>Joint pain 10 to 14 days after an untreated strep throat suggests rheumatic fever. Joint injury occurs from trauma or repetitive motion.</td>
</tr>
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</tr>
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</tr>
<tr>
<td>Any limitation of movement in any joint? Which joint?</td>
<td>Decreased ROM may be due to joint disease or to muscle contracture.</td>
</tr>
<tr>
<td>Which activities give you problems? (See Functional assessment below)</td>
<td>Myalgia is usually felt as cramping or aching.</td>
</tr>
<tr>
<td>Any problems in the muscles, such as any pain or cramping? Which muscles?</td>
<td>Suggests intermittent claudication (Ch 11).</td>
</tr>
<tr>
<td>If in calf muscles: Is the pain with walking? Does it go away with rest?</td>
<td>Viral illness often includes myalgia.</td>
</tr>
<tr>
<td>Are your muscle aches associated with fever, chills, the ‘flu’?</td>
<td>Weakness may involve peripheral vascular system or neurological systems (Chs 11 and 22).</td>
</tr>
<tr>
<td>Any weakness in muscles?</td>
<td>Smaller muscles indicate atrophy. Swelling may indicate haematoma or tumour.</td>
</tr>
<tr>
<td>Location: Where is the weakness? How long have you noticed weakness?</td>
<td></td>
</tr>
<tr>
<td>Do the muscles look different there?</td>
<td></td>
</tr>
<tr>
<td>Any bone pain? Is the pain affected by movement?</td>
<td></td>
</tr>
<tr>
<td>Any deformity of any bone or joint? Is the deformity due to injury or trauma? Does the deformity affect ROM?</td>
<td></td>
</tr>
<tr>
<td>Any accidents or trauma ever affected the bones or joints: fractures, joint strain, sprain, dislocation? Which ones?</td>
<td></td>
</tr>
<tr>
<td>When did this occur? What treatment was given? Any problems or limitations now as a result?</td>
<td></td>
</tr>
<tr>
<td>Any back pain? In which part of your back? Is pain felt anywhere else, like shooting down your leg or arm?</td>
<td></td>
</tr>
<tr>
<td>How long have you had this pain?</td>
<td></td>
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<tr>
<td>Any numbness and tingling? Any limping?</td>
<td></td>
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<tr>
<td></td>
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<tr>
<td><strong>5 Functional assessment (ADLs).</strong></td>
<td></td>
</tr>
<tr>
<td>How do your joint (muscle, bone) problems create any limits on your usual activities of daily living (ADLs)? Which ones? (Note: Ask about each category; if the person answers ‘yes’, ask specifically about each activity in category.)</td>
<td></td>
</tr>
<tr>
<td>Bathing—getting in and out of the shower/ bath, turning on taps? Can you wash your back, legs, feet, hair?</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Assessment guidelines

- Toileting—urinating, moving bowels, able to get self on/off toilet, wipe self?

- Dressing—doing buttons, zipper, fasten opening behind neck, pulling dress or sweater over head, pulling up pants. Tying shoelaces, getting shoes that fit?

- Grooming—shaving, brushing teeth, brushing or fixing hair, applying make-up?
- Eating—preparing meals, pouring liquids, cutting up foods, bringing food to mouth, drinking?
- Mobility—walking, walking up or down stairs, getting in/out of bed, getting out of house?
- Communicating—talking, using phone, writing?

6 Self-care behaviours. Any occupational hazards that could affect the muscles and joints? Does your work involve heavy lifting? Is there any repetitive motion or chronic stress to joints in your work? What measures have you used to alleviate these?

- Tell me about your exercise program. Describe the type of exercise, frequency, the warm-up program.
- Any pain during exercise? How do you treat it?
- Has your weight changed recently? Please describe your usual daily diet. (Note the person’s usual caloric intake, all four food groups, daily amount of protein, calcium.)

- Are you taking any medications for musculoskeletal system: aspirin, anti-inflammatory, muscle relaxant, pain reliever? Are you taking any herbal supplements, vitamins or other ‘natural remedies’?

- If person has chronic disability and/or severe musculoskeletal dysfunction:
  How have these symptoms/illness affected:
  Your interaction with family and friends
  Your employment and leisure activities
  The way you view yourself
  How you manage your health
  The impact on your social life
  The impact on your stress levels and coping ability?

Clinical significance and clinical alerts

- Altered bowel and bladder function may be an indication of cauda equina syndrome.
  Indicates upper limb dysfunction.
- Degenerative processes lead to foot deformity, pain and disability. The person over 65 years also loses their ability to care for their feet. Foot deformities and ill-fitting shoes all increase falls risk.
  Indicates upper limb dysfunction or psychosocial issues.
- Indicates upper limb dysfunction or psychosocial issues.
  When the person is found to have significant impairment of mobility a falls risk screening must be conducted.
  Indicates upper limb/hand dysfunction.
- Chronic diseases can cause social isolation and depression.
  Assess risk for back injury, rotator cuff damage or carpal tunnel syndrome.
  Where the workplace is identified as contributing to potential injury the person should undergo a formal workplace assessment.

- Weight impacts on joint function.
  Low calcium and vitamin D together with smoking and excessive alcohol are associated with osteoporosis.
  Over-the-counter medications are common first-line treatments for joint pain, e.g. glucosamine.
  Chronic pain sufferers often use multiple analgesia. Herbal medications have iatrogenic effects. The potential interactions of herbal medicines with allopathic medicines have been well documented (Moses and McGuire, 2010).
  Assess for
  - Self-esteem disturbance
  - Loss of independence
  - Body image disturbance
  - Role performance disturbance
  - Social isolation/stress and coping.
  - Health management ability.
  Significant issues in any of these areas may indicate the need for further focused assessment.
Additional history for infants and children

Children with musculoskeletal problems often present to primary care services with traumatic or non-traumatic injuries. The majority of problems are self-limiting; however, the presentation of life-threatening illnesses such as malignancy or septic arthritis will require urgent referrals to specialty services. Chronic illnesses such as juvenile arthritis and the muscular dystrophies also require urgent referrals to improve care outcomes. Delays in access to care are well reported in childhood musculoskeletal illnesses (Dang-Tan and Franco, 2007; Foster et al, 2009; Mohamed et al, 2000).

Ask the parent the following questions:

1. Were you told about any trauma to infant during labour and delivery? Did the baby’s come head first? Was there a need for forceps?
2. Did the baby need resuscitation?
3. Were the baby’s motor milestones achieved at about the same time as siblings or age mates? Have any of the baby’s milestones changed recently?
4. Has your child been well? Any weight loss, fever or malaise?
5. Has your child ever broken any bones? Any bruising or dislocations? Where and how were these treated?
6. Have you ever noticed any bone deformity? Head tilting or spinal curvature? Unusual shape of toes or feet? At what age? Have you ever sought treatment for any of these?

Additional history for adolescents

1. Involved in any sports at school or after school? How frequently (times per week)?

Children with growing pains do not limp or experience morning stiffness.

Non-accidental injury

Non-accidental injury (NAI) can present as unexplained fracture patterns or bruising with incongruity between child’s and the carer’s/parent’s history. Ensuring the child’s safety and completing detailed documentation are priorities. Refer to your local State and Territory legislation on non-accidental injury and your local hospital/community guidelines for assessment and treatment plans.

The nurse within the emergency department and primary setting requires a comprehensive knowledge of growth and development patterns from neonate to adolescent and the associated disease and injury profiles at different stages. Effective pain management is also essential if a comprehensive and targeted history is to be obtained.

Traumatic delivery increases risk for fractures (e.g. humerus, clavicle) and hip dysplasia.

Period of anoxia may result in hypotonia of muscles.

Pain, joint dysfunction, malaise and fever all impact on activity and learning capacity, hence milestones may be affected. For example, toddler may stop walking, develop enuresis or have sleep disturbances.

Recent fever with pain and/or swelling of one joint or bone may indicate an infective or inflammatory process.

Fractures of the epiphyseal plate may lead to deformity.

Immediate pain and swelling following traumatic injury and mechanical dysfunction may indicate a musculoskeletal condition.

Gait changes can indicate normal development or undiagnosed hip problems, e.g. DDH, Perthes and slipped upper femoral epiphysis (SUFE).

Spinal problems may present as asymmetrical ribs or waist and head tilting.

40% of bone mass accumulates during adolescence. This is achieved through exercise and a healthy diet.
Assessment guidelines | Clinical significance and clinical alerts
--- | ---
2 Do you use any special equipment? Does any training program exist for your sport? | Assess use of safety equipment (e.g. mouth guards, helmets) and safe sporting practices. Use of safety equipment and presence of adult supervision decreases risk of sports injuries. Lack of adequate warm-up increases risk of sports injury. Students may not report injury or pain for fear of limiting participation in sport. Adolescents with scoliosis may report unilateral changes in shoulders, rib cage, hip levels and an uneven waist.

3 What is the nature of your daily warm-up? | Lack of adequate warm-up increases risk of sports injury.

4 What do you do if you get hurt? | Students may not report injury or pain for fear of limiting participation in sport.

5 Have you ever noticed any bone deformity? Spinal curvature? | Adolescents with scoliosis may report unilateral changes in shoulders, rib cage, hip levels and an uneven waist.

**Additional history for the adult over 65 years**
The questions you should ask the adult should be focused on functional abilities. The aim is to elicit any loss of function, self-care deficit, or safety risk that may occur as a process of ageing or musculoskeletal illness.

1 Any change in weakness over the past months or years? | Pain/joint dysfunction impacts on activity and increases weakness and lethargy. It is essential to focus on exploring all falls risks in a positive manner. All gait aids should be supplied as part of a comprehensive mobility assessment performed by a physiotherapist.

2 Any increase in falls or stumbling over the past months or years? | Pain/joint dysfunction impacts on activity and increases weakness and lethargy. It is essential to focus on exploring all falls risks in a positive manner. All gait aids should be supplied as part of a comprehensive mobility assessment performed by a physiotherapist.

3 Do you use any walking aids to help you get around inside your home and outside your home? Where did you purchase these walking aids? | Pain/joint dysfunction impacts on activity and increases weakness and lethargy. It is essential to focus on exploring all falls risks in a positive manner. All gait aids should be supplied as part of a comprehensive mobility assessment performed by a physiotherapist.

**OBJECTIVE DATA**
The purpose of the musculoskeletal examination is to assess patterns of pain, joint abnormalities, and the impact these have on the person’s activities of daily living (ADLs) and psychosocial functioning. Note additional ADL information as the person goes through the motions necessary for an examination: gait, posture, how the person sits in a chair, rises from chair, takes off jacket, manipulates a small object such as a pen and rises from the supine position. It is essential to identify painful joints during the history to ensure these are examined last.

The subjective data will assist in targeting your objective assessment and referral criteria. Musculoskeletal assessment can be challenging for the nurse and the person. It often involves asking intimate questions as well as requiring the person to be partially undressed and therefore vulnerable. You need to ensure the privacy and comfort of the person during musculoskeletal assessment (Ch 6).

All forms of musculoskeletal assessment require a systematic approach:

- Head to toe
- Proximal to distal
- Compare corresponding paired joint.

Expect symmetry of structure and function and normal parameters for that joint.

In addition, a neurovascular assessment of upper and lower limbs is a mandatory component for all musculoskeletal assessments (see Chs 11 and 22 for details of vascular and neurological assessment).

As you approach this examination, focus on the principles of ‘look, feel, then move’.

**Look (inspect)**—asymmetry of joints, joint swelling, deformity, abnormalities of muscle and soft tissue bulk, erythema, ecchymosis, lesions and rashes, general health of the patient

**Feel (palpate)**—soft tissue swelling, bony or crystal nodules, tenderness, joint warmth and pain

**Move**—active movement first followed by passive movement. Perform painful movements last.
CHAPTER 15  Musculoskeletal system

GALS SCREENING ASSESSMENT

Gait
Observe the person walking, turning then walking back.
Observe for symmetry and smoothness of gait.
Does the patient limp?
Observe for any reduced muscle bulk in the gluteals.
Can the person turn quickly?

Arms
Shoulder movements (Figs 15.15, A and B)
Ask the patient to place their hands behind their head, with their elbows back.
This movement assesses abduction, external rotation of the shoulder and elbow flexion.
Palpate each shoulder for rotator cuff problems.
Elbow movements and hands
Ask the patient to extend their arms fully and turn their hands over so palms are down (Fig 15.15, C).
Following this ask the patient to turn their hands over.
Observe the elbow and hands for any joint/tissue swelling or deformities.
Grip strength (Figs 15.15, D and E)
Ask the patient to make a fist. Observe the hand and finger movements.
Ask the patient to grip your fingers and assess the degree of grip strength.
Squeeze across the second to fifth metacarpal. Observe for pain.

Legs
Patient is lying down with upper torso covered.
Hip movement
Hold the knee and hip flexed to 90 degrees. Assess the degree of internal rotation in each hip (Fig 15.15, F).
Knee
Observe for any reduced muscle bulk especially in quadriceps.
Assess: ask patient to flex and extend both knees.
Palpate the knee for crepitus and warmth.
Inspection of feet
Inspect the feet for any swelling, deformity or any callosities (Fig 15.15, G).
Look at patient’s shoes for unequal wear.

Spine
Inspect the spinal column for any abnormalities including kyphosis, scoliosis or lordosis.
Observe for symmetry of legs and pelvis.
Cervical spine
Ask the patient to bring their ear towards their shoulder—assesses lateral cervical flexion (Fig 15.15, I).
Thoracolumbar spine
Hold the patient’s pelvis from behind and ask them to turn from side to side—assesses thoracolumbar rotation.
Ask the patient to touch their toes. Palpate for the range of lumbar movement (Fig 15.15, H). Place two fingers over the lumbar vertebrae. Your fingers should move apart as the patient bends forwards—assesses lumbar spine movement.
Record results using the framework of Figure 15.15, J. When abnormal results are obtained on the screening GALS assessment proceed to a more detailed physical examination.

Abnormal findings and clinical alerts

Antalgic gait is a symptom of pain with weight bearing. The stance phase of the gait is abnormally shortened relative to the swing phase.
Ataxia is gross lack of coordination of muscle movement. It is a neurological sign (see Ch 22).
**OBJECTIVE DATA**

**Procedures and normal findings**

- **A**
  - Normal findings
- **B**
  - Normal findings
- **C**
  - Normal findings
- **D**
  - Normal findings
- **E**
  - Normal findings
- **F**
  - Normal findings
- **G**
  - Normal findings
- **H**
  - Normal findings
- **I**
  - Normal findings

**Abnormal findings and clinical alerts**

- **A**
  - Abnormal findings
- **B**
  - Abnormal findings
- **C**
  - Abnormal findings
- **D**
  - Abnormal findings
- **E**
  - Abnormal findings
- **F**
  - Abnormal findings
- **G**
  - Abnormal findings
- **H**
  - Abnormal findings
- **I**
  - Abnormal findings

Figure 15.15  The GALS screening assessment.

**FURTHER OBJECTIVE ASSESSMENT FOR ADVANCED PRACTICE**

The assessments that are described in the following sections require advanced skill and scope of practice. A complete musculoskeletal examination, as described in the following section, is appropriate for persons with a positive musculoskeletal screening assessment.
Inspection

Note the size and contour of the joint. Inspect the skin and tissues over the joints for colour, swelling and any masses or deformity. Presence of swelling is significant and signals joint irritation.

Swelling may be excess joint fluid (effusion), thickening of the synovial lining, inflammation of surrounding soft tissue (bursae, tendons) or bony enlargement.

Deformities include dislocation (one or more bones in a joint being out of position), subluxation (partial dislocation of a joint), contracture (shortening of a muscle leading to limited ROM of joint) or ankylosis (stiffness or fixation of a joint).

Palpation

Palpate each joint, including its skin for temperature, its muscles, bony articulations and area of joint capsule. Notice any heat, tenderness, swelling or masses. Joints are not normally tender to palpation. If any tenderness does occur, try to localise it to specific anatomical structures (e.g. skin, muscles, bursae, ligaments, tendons, fat pads or joint capsule).

The synovial membrane is not normally palpable. When thickened, it feels ‘doughy’ or ‘boggy’. A small amount of fluid is present in the normal joint, but it is not palpable.

Palpable fluid is abnormal. Because fluid is contained in an enclosed sac, if you push on one side of the sac, the fluid will shift and cause a visible bulging on another side.

Range of motion (ROM)

Ask for active ROM while stabilising the body area proximal to that being moved. Familiarise yourself with the type of each joint and its normal ROM so that you can recognise limitations. If you see a limitation, gently attempt passive motion. Anchor the joint with one hand while your other hand slowly moves it to its limit. The normal ranges of active and passive motion should be the same.

If any limitation or any increase in ROM occurs, use a goniometer to measure the angles precisely (Fig 15.16). First extend the joint to neutral or 0 degrees. Center the 0 point of the goniometer on the joint. Keep the fixed arm of the goniometer on the 0 line and use the movable arm to measure; then flex the joint and measure through the goniometer to determine the angle of greatest flexion.
Joint motion normally causes no tenderness, pain or crepitation. Do not confuse crepitation with the normal discrete ‘crack’ heard as a tendon or ligament slips over bone during motion, such as when you do a knee bend.

**Muscle testing**

Test the strength of the prime mover muscle groups for each joint. Repeat the motions you elicited for active ROM. Now ask the person to flex and hold as you apply opposing force. Muscle strength should be equal bilaterally and should fully resist your opposing force. (Note: Muscle status and joint status are inter-dependent and should be interpreted together. Ch 22 discusses the examination of muscles for size and development, tone and presence of tenderness.)

A wide variability of strength exists among people. You may wish to use a grading system from no voluntary movement to full strength, as shown.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>% Normal</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Full ROM against gravity, full resistance</td>
<td>100</td>
<td>Normal</td>
</tr>
<tr>
<td>4</td>
<td>Full ROM against gravity, some resistance</td>
<td>75</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Full ROM with gravity</td>
<td>50</td>
<td>Fair</td>
</tr>
<tr>
<td>2</td>
<td>Full ROM with gravity eliminated (passive motion)</td>
<td>25</td>
<td>Poor</td>
</tr>
<tr>
<td>1</td>
<td>Slight contraction</td>
<td>10</td>
<td>Trace</td>
</tr>
<tr>
<td>0</td>
<td>No contraction</td>
<td>0</td>
<td>Zero</td>
</tr>
</tbody>
</table>

**TEMPOROMANDIBULAR JOINT**

With the person seated, *inspect* the area just anterior to the ear. Place the tips of your first two fingers in front of each ear and ask the person to open and close the mouth. Drop your fingers into the depressed area over the joint, and note smooth motion of the mandible. An audible and palpable snap or click occurs in many healthy people as the mouth opens (Fig 15.17). Then ask the person to:

**Instructions to person**
- Open mouth maximally.
- Partially open mouth, protrude lower jaw and move it side to side.
- Stick out lower jaw.

**Motion and expected range**
- Vertical motion. You can measure the space between the upper and lower incisors. Normal is 3 to 6 cm, or three fingers inserted sideways.
- Lateral motion. Normal extent is 1 to 2 cm (Fig 15.18).
- Protrude without deviation.

Swelling looks like a round bulge over the joint, although it must be moderate or marked to be visible.

Crepitus and pain occur with temporomandibular joint dysfunction

Lateral motion may be lost earlier and more significantly than vertical.
**Procedures and normal findings**

<table>
<thead>
<tr>
<th>Abnormal findings and clinical alerts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palpate the contracted temporalis and masseter muscles as the person clenches the teeth. Compare right and left sides for size, firmness and strength. Ask the person to move the jaw forwards and laterally against your resistance, and to open mouth against your resistance. This also tests the integrity of cranial nerve V (trigeminal).</td>
</tr>
</tbody>
</table>

**CERVICAL SPINE**

**Inspect** the alignment of head and neck. The spine should be straight and the head erect. **Palpate** the spinous processes and the sternomastoid, trapezius and paravertebral muscles. They should feel firm, with no muscle spasm or tenderness.

- Head tilted to one side.
- Asymmetry of muscles.
- Tenderness and hard muscles with muscle spasm.
Procedures and normal findings

Ask the person to follow these motions (Fig 15.19):

**Instructions to person**
- Touch chin to chest.
- Lift the chin towards the ceiling.
- Touch each ear towards the corresponding shoulder. Do not lift up the shoulder.
- Turn the chin towards each shoulder.

**Motion and expected range**
- Flexion of 45 degrees (Fig 15.19, A).
- Hyperextension of 55 degrees.
- Lateral bending of 40 degrees (Fig 15.19, B).
- Rotation of 70 degrees (Fig 15.19, C).

Abnormal findings and clinical alerts

Practice alert—do not examine neck movement where there is any suspicion of neck trauma.
- Limited ROM.
- Pain with movement.

Repeat the motions while applying opposing force. The person normally can maintain flexion against your full resistance. This also tests integrity of cranial nerve XI (spinal).

**UPPER EXTREMITY**

**Shoulder**

Inspect and compare both shoulders posteriorly and anteriorly. Check the size and contour of the joint and compare shoulders for equality of bony landmarks. Normally, no redness, muscular atrophy, deformity or swelling is present. Check the anterior aspect of the joint capsule and the subacromial bursa for abnormal swelling.
If the person reports any shoulder pain, ask that they point to the spot with the hand of the unaffected side.

While standing in front of the person, palpate both shoulders, noting any muscular spasm or atrophy, swelling, heat or tenderness. Start at the clavicle and methodically explore the acromioclavicular joint, scapula, greater tubercle of the humerus, area of the subacromial bursa, the biceps groove and the anterior aspect of the glenohumeral joint. Palpate the pyramid-shaped axilla; no adenopathy or masses should be present.

Test ROM by asking the person to perform four motions (Fig 15.20). Cup one hand over the shoulder during ROM to note any crepitation; normally none is present.
Procedures and normal findings

The adult over 65 years

Postural changes include a decrease in height, more apparent in the eighth and ninth decades. ‘Lengthening of the arm-trunk axis’ describes this shortening of the trunk with comparatively long extremities. Kyphosis is common, with a backwards head tilt to compensate. This creates the outline of a figure 3 when you view this older adult from the left side. Slight flexion of hips and knees is also common.

Contour changes include a decrease of fat in the body periphery and fat deposition over the abdomen and hips. The bony prominences become more marked.

For most adults over 65, ROM testing proceeds as described earlier. ROM and muscle strength are much the same as with the younger adult, provided no musculoskeletal illnesses or arthritic changes are present.

**Functional assessment.** For those with advanced ageing changes, arthritic changes or musculoskeletal disability, perform a **functional assessment for ADLs.** This applies the ROM and muscle strength assessments to the accomplishment of specific activities. You need to determine adequate and safe performance of functions essential for independent home life.

**Instructions to person**

**Common adaptation for ageing changes**

1  Walk (with shoes on).
   - Shuffling pattern; swaying; arms out to help balance; broader base of support; person may watch feet.

2  Climb up stairs.
   - Person holds hand rail; may haul body up with it; may lead with favoured (stronger) leg.

3  Walk down stairs.
   - Holds hand rail, sometimes with both hands.
     - If the person is weak, they may descend sideways, lowering the weaker leg first.
     - If the person is unsteady, they may watch feet.

4  Pick up object from floor.
   - Person often bends at waist instead of bending knees; holds furniture to support while bending and straightening.

5  Rise up from sitting in chair.
   - Person uses arms to push off chair arms, upper trunk leans forwards before body straightens, feet planted wide in broad base of support.

6  Rise up from lying in bed.
   - May roll to one side, push with arms to lift up torso, grab bedside table to increase leverage.

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**Summary Checklist**

**Musculoskeletal exam**

For each joint to be examined:

1  **Inspection**
   - General inspection of ease of movement and flexibility

2  **Gait** (inspect, palpate, move)

3  **Arms** (inspect, palpate, move)

4  **Legs** (inspect, palpate, move)

5  **Spine** (inspect, palpate, move)
Bone is a dynamic tissue which responds to mechanical stresses through a complex process of remodelling. The remodelling process involves the resorption of micro damaged bone by osteoclast cells followed by a phase of bone formation by osteoblast cells. In healthy adults this process is coupled to ensure bone density remains stable. This process commences in childhood with peak bone mass reached by the end of the second decade of life. Studies suggest that more than 95% of the adult skeleton is formed by the end of adolescence (Rizzoli et al, 2010). There is also a direct link between total body fat in children and reduced bone health, emphasising the value of a healthy lifestyle from childhood through to adulthood (Hrafnkelsson, 2010).

When this bone remodelling process becomes uncoupled, normal bone density is altered leading to a change in the normal architecture of bone seen in diseases such as osteoporosis (Seeman et al, 2006). Osteoporosis is defined as a disease characterised by low bone mass and micro-architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk (WHO, 1994). The loss of bone occurs ‘silently’ and progressively. Often there are no symptoms until the first fracture occurs. Fractures associated with osteoporosis are termed low trauma or fragility fractures and occur most frequently in the neck of femur, vertebrae and distal radius.

The impact of osteoporosis and the resultant low trauma fractures are devastating; 1 in 2 women and 1 in 3 men over 60 years in Australia will suffer an osteoporotic fracture (Osteoporosis Australia, 2010b).

In Australia every day, more than 40 Australians break their hip. Most are aged 65 years or over, and more than half are aged 85 or over. Virtually all of these people will be admitted to hospital, and most will have some kind of surgery. Two people will die in the hospital, and at least four will need to go into a residential aged care facility, either while they recover or permanently. A year later, less than half of those original 40 people will be able to walk as well as they did before the fracture, and another six or seven will have died (AIHW, 2010b: 2).

In Australia it is estimated that more than half of all vertebral fractures do not receive any interventions, although nearly all are associated with disability and pain. It is also estimated that up to 80% of people with osteoporotic fractures remain undiagnosed and untreated. In addition, those people who sustain a low trauma fracture are at substantially greater (2-4-fold) risk of sustaining another fracture of a different type. This is called ‘the cascade effect’, as the risk of additional fractures increases exponentially with each new fracture (Langsetmo et al, 2009).

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Within their daily practice it is crucial for nurses to support patients on the highly successful pharmaceutical treatments for osteoporosis. A recent study by Weycker (2006) concluded that approximately 50–75% of women who start any type of anti-osteoporosis drug therapy (bisphosphonates, calcitonin, selective oestrogen receptor modulators) are no longer using it 12 months later. Osteoporosis is a chronic and ‘silent’ condition requiring long-term therapy. Patients may have difficulty understanding the value of dual energy x-ray absorptiometry (DEXA) scans or biochemical bone markers and may not perceive any clinical benefit from these medications.

### Risk factors for osteoporosis and fractures include both intrinsic and lifestyle factors.
- Genetics
- Maternal family history of osteoporotic fracture
- Increasing age
- Previous low trauma fracture particularly of the hip, spine or wrist
- Early menopause, late menarche (women)
- Absence or suppression of menstrual periods (amenorrhoea) >1 year
- Anorexia nervosa
- Comorbidity and medical treatments
- Corticosteroid therapy
- Malabsorption syndromes, including coeliac disease and inflammatory bowel disease
- Chronic renal and liver diseases
- Rheumatoid arthritis
- Anticonvulsant therapy
- Lifestyle factors
- Inadequate dietary calcium intake
- Vitamin D deficiency and/or lack of sunlight
- Physical inactivity/sedentary lifestyle over many years
- Smoking
- Regular, excessive alcohol use
- Increased risk of falls
- Poor muscle strength and balance
- Poor eyesight
- Obesity/sarcopenia
- Malnutrition
- Polypharmacy especially sedatives/psychotropics
- Depression
- Cognitive impairment

(Osteoporosis Australia, 2006)
Osteoporosis is a preventable disease in many cases. The key message for the nurse to share with their patients is that bone density and quality can significantly improve with lifestyle changes and long-term medications; for example, bisphosphonates can reduce fracture risks by up to 46%.

Osteoporosis Australia has centres in each state and territory offering a wide range of resources for both patients and health professionals.

www.arthritisaustralia.com.au  Arthritis Australia
www.osteoporosis.org.au  Osteoporosis Australia
http://www.bones.org.nz/
www.arthritisnsw.org.au  Arthritis New South Wales
www.arthritis.org.au  Arthritis Queensland
www.arthritisnsw.org.au  Arthritis South Australia
www.arthritis Tasmania.com.au  Arthritis Tasmania
www.arthritisvic.org.au  Arthritis Victoria
www.arthritiswa.org.au  Arthritis Western Australia
www.arthritissa.org.au  Arthritis South Australia
www.arthrititasmania.com.au  Arthritis Tasmania
www.arthritisvic.org.au  Arthritis Victoria
www.arthritisvic.org.au  Arthritis Western Australia
www.arthritisvic.org.au  Arthritis Northern Territory

FOCUSED ASSESSMENT: CLINICAL CASE STUDY

MT is a 45-year-old female office worker with a diagnosis of rheumatoid arthritis 3 years ago, who seeks care now for ‘swelling and burning pain in my hands’ for 1 day. She has not been assessed by a rheumatologist since diagnosis and is subsequently not on an effective disease-modifying treatment program.

Subjective

MT was diagnosed as having rheumatoid arthritis at age 41 years by a rheumatologist. Since that time, her ‘flare-ups’ seem to come every 6 to 8 months. Acute episodes involve hand joints and are treated with aspirin, which gives relief. Typically experiences morning stiffness, lasting ½ to 1 hour. Joints feel warm, swollen and tender. Has had weight loss of 4 kg over last 4 years and feels fatigued much of the time. States should rest more, but ‘I can’t take the time’. Daily exercises have been prescribed but doesn’t do them regularly. Takes aspirin for acute flare-ups, feels better in a few days, decreases dose by herself.

Objective

Body joints within normal limits with exception of joints of wrist and hands. Radiocarpal, metacarpophalangeal and proximal interphalangeal joints are red, swollen and tender to palpation. Spindle-shaped swelling of proximal interphalangeal joints of third digit right hand and second digit left hand; ulnar deviation of metacarpophalangeal joints.

Patient problems/nursing diagnoses

Acute pain R/T inflammation
Impaired physical mobility R/T inflammation
Deficient knowledge, denial about her disease, lack of understanding of perceived benefits of treatment
### ABNORMAL FINDINGS FOR ADVANCED PRACTICE

#### TABLE 15.1 Abnormalities affecting multiple joints

<table>
<thead>
<tr>
<th>INFLAMMATORY CONDITIONS</th>
<th>DEGENERATIVE CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rheumatoid arthritis (RA)</strong></td>
<td><strong>Osteoarthritis (degenerative joint disease)</strong></td>
</tr>
<tr>
<td>This is a chronic, systemic inflammatory disease of joints and surrounding connective tissue. Inflammation of synovial membrane leads to thickening; then to fibrosis, which limits motion, and finally to bony ankylosis. The disorder is symmetrical and bilateral and is characterised by heat, redness, swelling and painful motion of the affected joints. RA is associated with fatigue, weakness, anorexia, weight loss, low-grade fever and lymphadenopathy. Associated signs are described in the following tables, especially Table 15.4.</td>
<td>Noninflammatory, localised, progressive disorder involving deterioration of articular cartilages and subchondral bone and formation of new bone (osteophytes) at joint surfaces. Ageing increases incidence; nearly all adults over 60 years old have some radiographic signs of osteoarthritis. Asymmetrical joint involvement commonly affects hands, knees, hips and lumbar and cervical segments of the spine. Affected joints have stiffness, swelling with hard, bony protuberances, pain with motion and limitation of motion (see Table 15.4).</td>
</tr>
</tbody>
</table>

| **Ankylosing spondylitis (not illustrated)** | **Osteoporosis** |
| Chronic progressive inflammation of spine, sacroiliac and larger joints of the extremities, leading to bony ankylosis and deformity. A form of RA, this affects primarily men by a 10:1 ratio, in late adolescence or early adulthood. Spasm of paraspinal muscles pulls spine into forward flexion, obliterating cervical and lumbar curves. Thoracic curve exaggerated into single kyphotic rounding. Also includes flexion deformities of hips and knees. | Decrease in skeletal bone mass occurring when rate of bone resorption is greater than that of bone formation. The weakened bone state increases risk for stress fractures, especially at wrist, hip and vertebrae. Occurs primarily in postmenopausal women. Osteoporosis risk also is associated with smaller height and weight, younger age at menopause, lack of physical activity and lack of oestrogen replacement therapy. |
**TABLE 15.2 Abnormalities of the shoulder**

<table>
<thead>
<tr>
<th>Abnormality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atrophy</strong></td>
<td>Loss of muscle mass is exhibited as a lack of fullness surrounding the deltoid muscle. In this case, atrophy is due to axillary nerve palsy. Atrophy also occurs from disuse, muscle tissue damage or motor nerve damage.</td>
</tr>
<tr>
<td><strong>Dislocated shoulder</strong></td>
<td>Anterior dislocation (95%) is exhibited when hunching the shoulder forward and the tip of the clavicle dislocates. It occurs with trauma involving abduction, extension and rotation (e.g. falling on an outstretched arm or diving into a pool).</td>
</tr>
<tr>
<td><strong>Joint effusion</strong></td>
<td>Swelling from excess fluid in the joint capsule, here from rheumatoid arthritis. Best observed anteriorly. Fluctuant to palpation. Considerable fluid must be present to cause a visible distension because the capsule is normally so loose.</td>
</tr>
<tr>
<td><strong>Tear of rotator cuff</strong></td>
<td>Characteristic ‘hunched’ position and limited abduction of arm. Occurs from traumatic adduction while arm is held in abduction, or from fall on shoulder, throwing or heavy lifting. Positive drop arm test: If the arm is passively abducted at the shoulder, the person is unable to sustain the position and the arm falls to the side.</td>
</tr>
<tr>
<td><strong>Frozen shoulder—adhesive capsulitis</strong></td>
<td>Fibrous tissues form in the joint capsule, causing stiffness, progressive limitation of motion and pain. Motion limited in abduction and external rotation; unable to reach overhead. It may lead to atrophy of shoulder girdle muscles. Gradual onset; unknown cause. It is associated with prolonged bed rest or shoulder immobility. May resolve spontaneously.</td>
</tr>
<tr>
<td><strong>Subacromial bursitis (not illustrated)</strong></td>
<td>Inflammation and swelling of subacromial bursa over the shoulder cause limited ROM and pain with motion. Localised swelling under deltoid muscle may increase by partial passive abduction of the arm. Caused by direct trauma, strain during sports, local or systemic inflammatory process or repetitive motion with injury.</td>
</tr>
</tbody>
</table>
### TABLE 15.3 Abnormalities of the elbow

<table>
<thead>
<tr>
<th>Abnormality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Olecranon bursitis</strong></td>
<td>Large soft knob, or 'goose egg', and redness from inflammation of olecranon bursa. Localised and easy to see because bursa lies just under skin.</td>
</tr>
<tr>
<td><strong>Gouty arthritis</strong></td>
<td>Joint effusion or synovial thickening, seen first as bulge or fullness in grooves on either side of olecranon process. Redness and heat can extend beyond area of synovial membrane. Soft, boggy or fluctuant fullness to palpation. Limited extension of elbow.</td>
</tr>
<tr>
<td><strong>Gouty arthritis</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Subcutaneous nodules</strong></td>
<td>Raised, firm, nontender nodules that occur with rheumatoid arthritis. Common sites are in the olecranon bursa and along extensor surface of arm. The skin slides freely over the nodules.</td>
</tr>
<tr>
<td><strong>Epicondylitis—tennis elbow</strong></td>
<td>Chronic disabling pain at lateral epicondyle of humerus; radiates down extensor surface of forearm. Pain can be located with one finger. Resisting extension of the hand will increase the pain. Occurs with activities combining excessive pronation and supination of forearm with an extended wrist (e.g. racquet sports or using a screwdriver). Medial epicondylitis is rarer and is due to activity of forced palmar flexion of wrist against resistance.</td>
</tr>
</tbody>
</table>


Lillicrap MS, Byrne E, Speed CA: Musculoskeletal assessment of
general medical in-patients—joints still crying for attention,
a life and limb threatening surgical emergency, *Journal of
Manners PJ: Delay in diagnosing juvenile arthritis, *Med J Aust*
Matthews B, Cundy T: Mechanisms of disease—Paget’s disease of
2009.
Moc R, Lim MD et al: Evaluation of the elderly patient with an
Mohamed K, Appleton R, Nicolaides P: Delayed diagnosis of
2000.
Moses GM, McGuire T: Drug interactions with complementary
Osteoporosis Australia, 2006: *Prevent the next fracture—guide for
Osteoporosis Australia, 2010b: *Prevent the next fracture—health profes-
Pink B, Allbon P: *The health and welfare of Australia’s Aboriginal and
Torres Strait Islander peoples*, ABS and AIHW, 2008, AIHW cat. no.
IHW 21; ABS cat. no. 4704.0. Available at http://www.aihw.gov.
au/publications/ihw/hwaatsip08/hwaatsip08.pdf
Read KM, Kufera JA, Dischinger PC, et al: Life altering outcomes
after lower extremity injury sustained in motor vehicle crashes,
Rizzoli R, Bianchi M, Garabédian M et al: Maximizing bone mineral
mass gain during growth for the prevention of fractures in the
Rosendahl K: Ultrasound in the diagnosis of developmental
Rupert SA: Pathogenesis and treatment of rhabdomyolysis, *J Am
Scoliosis Australia (nd): *The national self detection program for scolio-
sis*. Available at http://www.scoliosis-australia.org/scoliosis/self_detection_prog.html
Seeman E, Delmas PD: Bone quality—the material and structural
Thomas-John M, Codd MB, Manne S et al: Risk factors for the
development of osteoporosis and osteoporotic fractures among
Transport Accident Commission, 2008: *The cost of road trauma 2008*.
Available at http://www.tacsafety.com.au/upload/TAC-civics-
task-part-four.pdf
Van Slobbe AM, Bohnen AM, Bernsen RM et al: Incidence rates
and determinants in meralgia paresthetica in general practice,
Weycker D, Macarios D, Edelsberg J et al: Compliance with drug
therapy for postmenopausal osteoporosis, *Osteoporos Int* 17(11):
World Health Organization (WHO), 2004: *Revised global burden of
disease (GBD) 2002 estimates. Years lost due to disability (YLD)*,
healthinfo/bodgbd2002revised/en/index.html
World Health Organization: Assessment of fracture risk and its applica-
tion to screening for postmenopausal osteoporosis: report of a WHO
to reduce fear of falling in community-living older people: a
systematic review, *Progress in Geriatrics*. *Journal of Geriatric Society