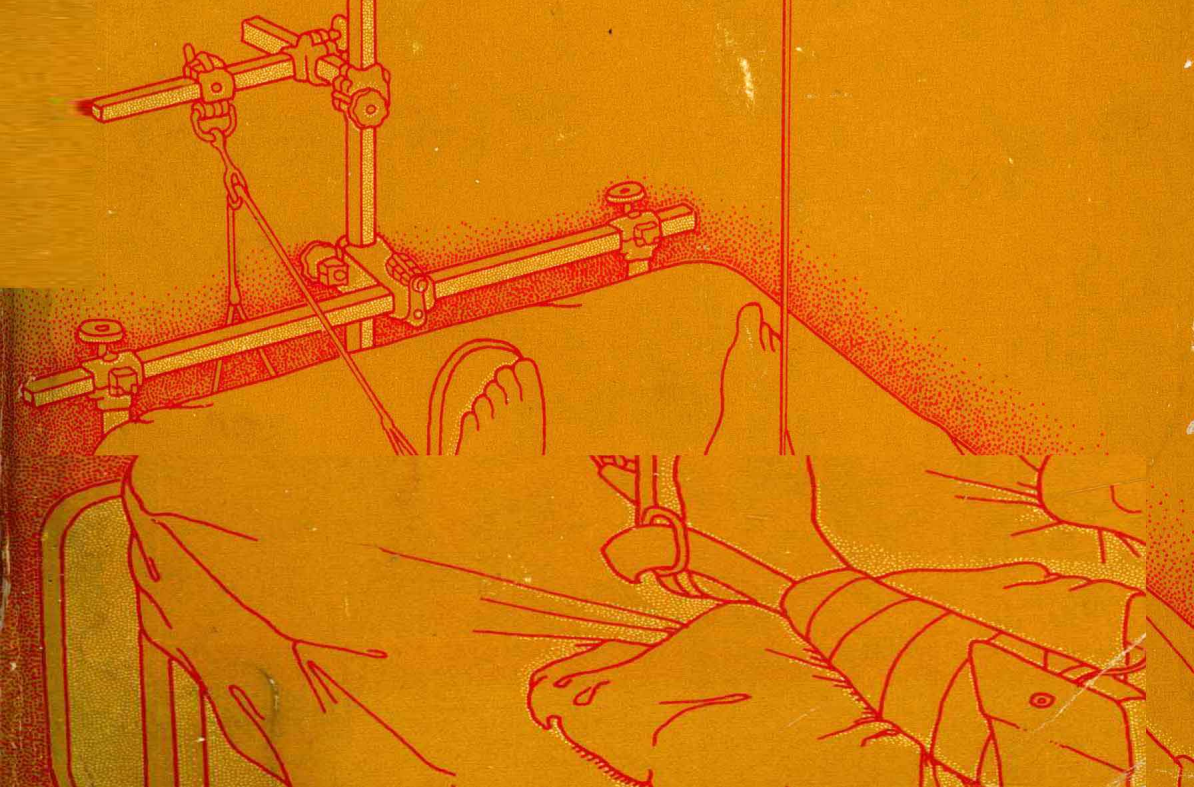


Clara A. Donahoe, R.N.

Joseph H. Dimon III, M.D.

# ORTHOPEDIC NURSING



# ORTHOPEDIC NURSING

CLARA A. DONAHOO, R.N.

Orthopedic Nurse Specialist

JOSEPH H. DIMON III, M.D.

Orthopedic Surgeon

Both at the Peachtree Orthopedic Clinic  
Atlanta, Georgia

LITTLE, BROWN AND COMPANY  
Boston

Copyright © 1977 by Little, Brown and Company (Inc.)

First Edition

All rights reserved. No part of this book may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without permission in writing from the publisher, except by a reviewer who may quote brief passages in a review.

Library of Congress Catalog Card No. 76-52626

ISBN 0-316-18940-5

Printed in the United States of America

# PREFACE

It has been our intent to present clearly and concisely material that is pertinent in the daily practice of orthopedic nursing. Although the text is designed primarily for the orthopedic nurse-practitioner, it will be of value to nursing students as well as those nurses re-entering the profession in this specialty.

This text on orthopedic nursing is intended to be a supplementary text or reference book dealing only with the nursing care of those patients with known or suspected diseases or conditions of the neuromusculoskeletal system. Because the specialty of orthopedics encompasses so many recognized modes of treatment, we have limited our discussion to the clinical problems most frequently encountered. The psychosocial aspects of orthopedic nursing have not been dealt with in detail, and we would refer the reader to specialized books on this subject for more information.

We realize that a nurse caring for an orthopedic patient must first have a basic understanding of the principles of nursing practice as well as clinical expertise in caring for patients. This book was written for nurses with these fundamental skills.

The specialty of orthopedics is constantly changing, as is the nursing care of patients. We have presented the current concepts of treatment and nursing care. Although techniques and equipment may vary geographically, the underlying principles are the same.

We would like to think of this book as a testimonial to our basic conviction that orthopedic surgeons and orthopedic nurses can and should work closely together to improve the quality of care of the orthopedic patient.

We acknowledge the outstanding assistance of King Dasher in the preparation of photographic materials used in this text. The drawings were expertly rendered by George DeGrazio of Idaho Springs, Colorado.

C. A. D.  
J. H. D.  
Atlanta

# ORTHOPEDIC NURSING

# CONTENTS

Preface v

## 1. NURSING ASSESSMENT 1

History 1

Physical Assessment 2

Laboratory Studies 13

X-ray Interpretation 15

Nursing Diagnosis 28

## 2. TRAUMA 31

Initial Nursing Assessment 31

Initial Nursing Actions 31

Fractures and Joint Injuries 32

Fractures / General Principles of Fracture Treatment / Joint Injuries /  
Rehabilitation of Fractures and Joint Injuries / Skeletal Injuries of the  
Trunk / Chest Injuries / Upper Limb Injuries / Lower Limb Injuries

Amputations 90

## 3. COMMON DISEASE PROCESSES AND CONDITIONS 93

Congenital Disorders 93

Congenital Dislocation of the Hip / Congenital Coxa Vara / Osteo-  
genesis Imperfecta / Hereditary Multiple Exostoses / Achondroplasia /  
Vitamin D-Resistant Rickets and Renal Tubular Rickets / Arthrogryposis  
Multiplex Congenita / Neurofibromatosis / Klippel-Feil Syndrome /  
Congenital High Scapula (Sprengel's Deformity) / Cervical Rib / Talipes  
Equinovarus / Metatarsus Varus / Congenital Deformities of the Spine /  
Other Congenital Disorders

Inflammatory Diseases 109

Rheumatoid Arthritis / Marie-Strümpell Arthritis / Bursitis / Myositis /  
Myositis Ossificans

Neoplastic Disorders 117

Osteochondroma / Chondroma or Enchondroma / Osteoid-Osteoma /  
Osteogenic Sarcoma / Giant-Cell Tumor / Unicameral Bone Cyst /  
Fibrous Dysplasia / Multiple Myeloma / Metastatic Bone Disease /  
Paget's Disease (Osteitis Deformans)

Metabolic Diseases 126

Gout / Osteoporosis / Osteomalacia

Infection of Bone 127

Osteomyelitis

|  |            |
|--|------------|
| Degenerative Joint Disease   | 129        |
| Osteoarthritis / Traumatic Arthritis / Charcot Joint / Hemophilic Arthritis  |            |
| Neuromuscular Disorders  | 133        |
| Cerebral Palsy / Anterior Poliomyelitis / Friedreich's Ataxia / Charcot-Marie-Tooth Disease / Obstetrical Palsy / Polyneuritis / Infectious Polyneuritis / Progressive Muscular Dystrophy / Myasthenia Gravis / Trauma to Peripheral Nerves / Herniated Intervertebral Disc  |            |
| Disorders of the Epiphyses   | 139        |
| Slipped Capital Femoral Epiphysis / Legg-Calvé-Perthes' Disease / Osgood-Schlatter Disease / Sever's Disease   |            |
| Conditions Not Otherwise Classified  | 141        |
| Avascular (Aseptic) Necrosis / Spondylolysis / Spondylolisthesis / Baker's Cyst (Popliteal Cyst) / Trigger Thumb / Dupuytren's Contracture / Ganglion / Morton's Neuroma / Scoliosis   |            |
| Other Significant Diseases   | 146        |
| Diabetes / Cardiac Disease / Peripheral Vascular Disease / Gastrointestinal Disease  |            |
| <b>4. PLAN FOR NURSING CARE</b>  | <b>149</b> |
| Goals  | 149        |
| The Care Plan  | 150        |
| General Care   | 150        |
| Turning the Orthopedic Patient / Use of the Overhead Trapeze / Pelvic Lift / Use of an Exercise Sling / Neurovascular Checks of an Extremity / Pain  |            |
| Nursing Care of the Patient in Traction  | 159        |
| Manual Traction / Buck's Traction / Split Russell's Traction / 90-90 Pelvic Traction / Pelvic Traction / Cervical Traction / Side Arm Traction / Bryant's Traction / Balanced Suspension / Cotrel's Traction / Halo-Femoral Traction / Skeletal Cervical Traction / Pin Care in Skeletal Traction / Traction Materials |            |
| Nursing Care of the Patient in a Cast  | 171        |
| Cast Application / Patient Instructions / Nursing Care / Removal of a Cast   |            |
| General Preoperative Nursing Care  | 194        |
| General Postoperative Nursing Care   | 196        |
| Complications Frequently Seen in Orthopedic Nursing  | 207        |
| Thrombophlebitis / Pulmonary Embolus / Fat Embolus / Decubitus Ulcers / Osteomyelitis / Compartment Syndrome / Volkmann's Ischemic Contracture / Contracture Deformity / Paralytic Ileus / Postoperative Dislocation / Peroneal Nerve Palsy / Traumatic Neuritis / Related Systems                                     |            |

|  |     |
|--|-----|
| Orthopedic Devices, Equipment, and Materials                             | 220 |
| Wedge Stryker Frame / CircOlectric Bed / Braces / Soft Goods Materials   |     |
| Rehabilitation   | 225 |
| Terminology of Range of Motion Exercises / General Bed Exercises /       |     |
| Transfer Activities / Crutch Walking / Use of a Walker / Use of a Cane / |     |
| Patient and Family Education   |     |
| Discharge Planning   | 235 |
| Index  | 241 |



# 1. NURSING ASSESSMENT

Nursing assessment is the collection of information concerning the patient through interview, physical examination, and review of records and reports.

## HISTORY

All nursing histories should include the patient's medical diagnosis and therapy, past history, allergies, social habits, family history, and review of symptoms. There are certain areas of the interview history which, although pertinent with any patient, need elaboration for the person with a known or suspected neuromusculoskeletal alteration. Special attention is given to the history taken at the interview, as described in this section, since this information will be helpful in identifying neuromusculoskeletal injuries or disease processes by the causative factors, associated loss of function, or pain patterns.

It is important to know the *onset of symptoms* or the *mechanism and time of injury*. A careful history of the *progression of the symptoms* and *limitation of function* due to these symptoms should be recorded.

The orthopedic patient may have a variety of symptoms, but the nurse must be careful to obtain an accurate description of pain, weakness, numbness, or loss of function. These complaints are most important in the overall evaluation of a patient with a known or suspected orthopedic disease or condition. One must consider the entire symptom complex and the entire course rather than just the primary complaint.

To say that the patient has pain is inadequate; one must describe the quality or character of the pain and numbness or radiation associated with the pain. It is also important to document any limitation of motion that may be associated with the pain. Other factors to be considered are the time of occurrence or known causative factors. Many patients are able to obtain relief from pain by use of external supports, position, or medications; this information must be obtained and recorded.

Although the pharmacologic history is obtained for all patients, the interviewer must obtain information from all orthopedic patients, especially concerning their *previous use of steroids*. Most physicians now feel that any patient who has previously received steroids, regardless of the time element, should receive steroid coverage for any surgery.

## PHYSICAL ASSESSMENT

The physical examination is a part of the nursing assessment, although many nurses feel that this is not within the scope of nursing practice. The physical examination is more systematic when divided into *general assessment* and *orthopedic assessment* of the patient.

The normal versus the abnormal *general appearance* of an individual is discussed in many texts. The subject will not be belabored here, except to say that concurrently and recurrently the nurse caring for an orthopedic patient must be particularly aware of pressure points, skin petechiae, calf tenderness, and localized edema, since these findings are often pertinent to the patient's care.

The *orthopedic physical assessment* is essential not only in determining the diagnosis, but also in documenting the patient's progress and evaluating any permanent disability. The tools required are one's eyes, ears, hands, and a basic knowledge of norms. The accessory tools are a tape measure, a reflex hammer, a goniometer, and a safety pin. The nurse frequently sees the patient in a different setting and in a greater variety of situations than does the physician. These opportunities should be utilized to observe the patient when he or she is unaware. During this time the nurse may observe the overall position and appearance of the trunk and extremities. Apparent normal growth and development should also be noted.

Mobility in getting into or out of bed or a chair should be noted, as well as gait in an ambulatory patient. Use of external supports should be documented.

A basic understanding of *normal gait* is helpful to the nurse in evaluating gait abnormalities. When a person is standing, the weight of the body is evenly distributed on the two lower extremities; this is considered the normal stance. When walking forward, the left leg is advanced so that it is no longer touching the floor and all the body weight is transmitted to the right leg. The right leg is going through what is called a stance phase, supporting the body weight. As the left leg is brought forward and placed down on the floor, the first thing that happens is that the left heel strikes the floor; this is called the heel strike. The foot is then plantar flexed and the weight is gradually shifted from the stance phase, the weight bearing phase, of the right foot to the left lower extremity. Push-off occurs when the individual pushes off with the foot from the stance phase, the weight is borne on the forefoot, the heel comes off the ground, and the body is propelled forward. Push-off requires strong plantar flexion of the foot. The transmission of weight bearing from one extremity to another occurs in a predictable, smooth, and easy fashion unless there

is abnormality in the joints or muscles. When an individual stands on just one leg the center of gravity of the body falls medial to the hip joint of the stance leg. This position tends to make the pelvis drop down on the non-stance side. This force is balanced and the pelvis is held level by a contraction of the abductor muscles that run from the iliac portion of the pelvis to the greater trochanter of the stance hip. These muscles have to be contracted forcefully to hold the pelvis stable (approximate force of 2.5 times body weight). If for any reason there is pain in the hip joint or the abductor muscles do not function normally, a smooth balancing mechanism is absent and an abnormal gait will be noticed; the patient will swing the shoulders over the affected hip joint so that the center of gravity of the body drops through the hip joint, relieving the necessity of contracting the abductor muscles. These patients have what is called a shoulder-shift weight bearing gait, or abductor lurch.

If the quadriceps muscle cannot be normally contracted (because of paralysis, pain in the knee with use, and so forth) during the stance phase of gait, the knee will bend and the patient will fall unless he or she (1) keeps the center of gravity in front of the knee joint, thereby tightening the posterior knee joint capsule, which locks the knee in hypertension, or (2) plants the extremity in a plane that allows the joint to be stable without contracting the quadriceps. The patient accomplishes (1) by leaning forward over the knee when bearing weight on the affected side, or by pushing the thigh with a hand in order to keep the center of gravity in front of the knee. He or she accomplishes (2) by externally rotating the knee so that the bending force occurs in line with the medial collateral ligament, which is strong and will not allow the knee to give way in that particular plane.

If the presenting problem involves a joint, the *joint motion* must be measured and recorded. In order to record the findings in a language that will be understood by others, one must become familiar with the terms of joint range of motion. The terms used in the measurement and definition of joint range of motion include the following:

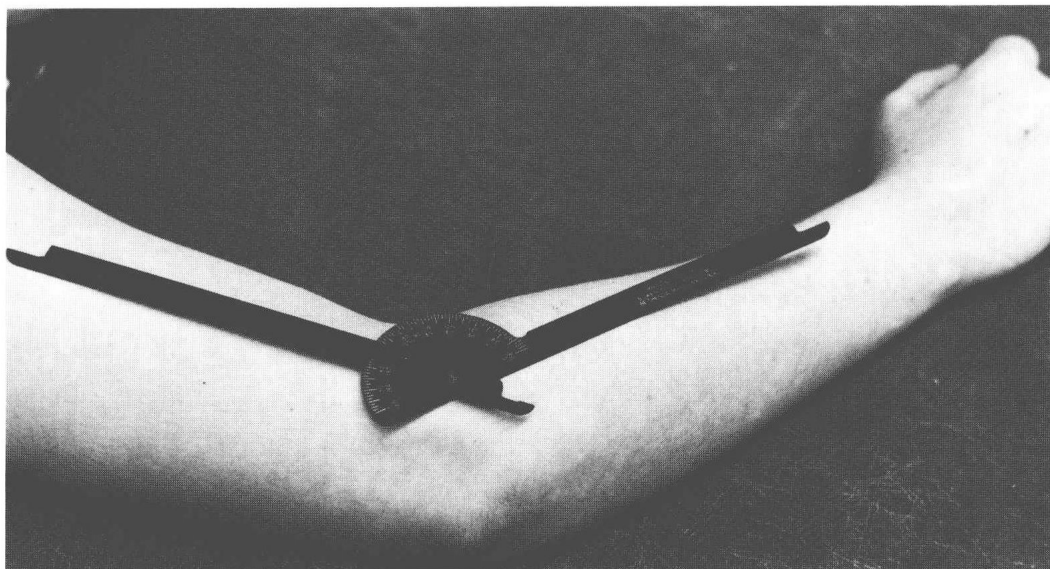
- Adduction — movement of the limb toward the body center
- Abduction — movement away from midline of the body
- Extension — straightening out of the joint (extremity)
- Hyperextension — extension beyond the ordinary range
- Pronation — turning downward (palm), turning downward and outward (foot)
- Supination — turning upward (palm), turning upward and inward (foot)

Flexion — bending of a joint (extremity)  
Dorsiflexion — lifting foot up toward shin (ankle), lifting fingers and wrist up (hand)  
Plantar flexion — pushing foot down (ankle), bending fingers and wrist down toward palm (hand)  
Rotation — turning or movement of a part around its axis  
Internal — turning inward toward the center  
External — turning outward away from the center  
Eversion — turning the foot outward  
Inversion — turning the foot toward the midline  
Radial deviation — movement of the hand toward the radius  
Ulnar deviation — movement of the hand toward the ulna  
Varus — abnormal deviation toward the midline of the alignment of the extremity distal to the joint or point of reference in the coronal plane  
Valgus — abnormal deviation away from the midline of the alignment of the extremity distal to the joint or point of reference in the coronal plane

The neutral (anatomic) position of any joint is 0 degrees. Flexion, extension, adduction, abduction, internal rotation, external rotation, supination and pronation (pertain to forearm only), and radial and ulnar deviation (pertain to wrist only) are all measured from this starting point of 0 degrees. If the elbow or knee normally extends past this neutral position, its placement should be termed hyperextension; similarly, the inability to assume the neutral position should be recorded as a flexion deformity.

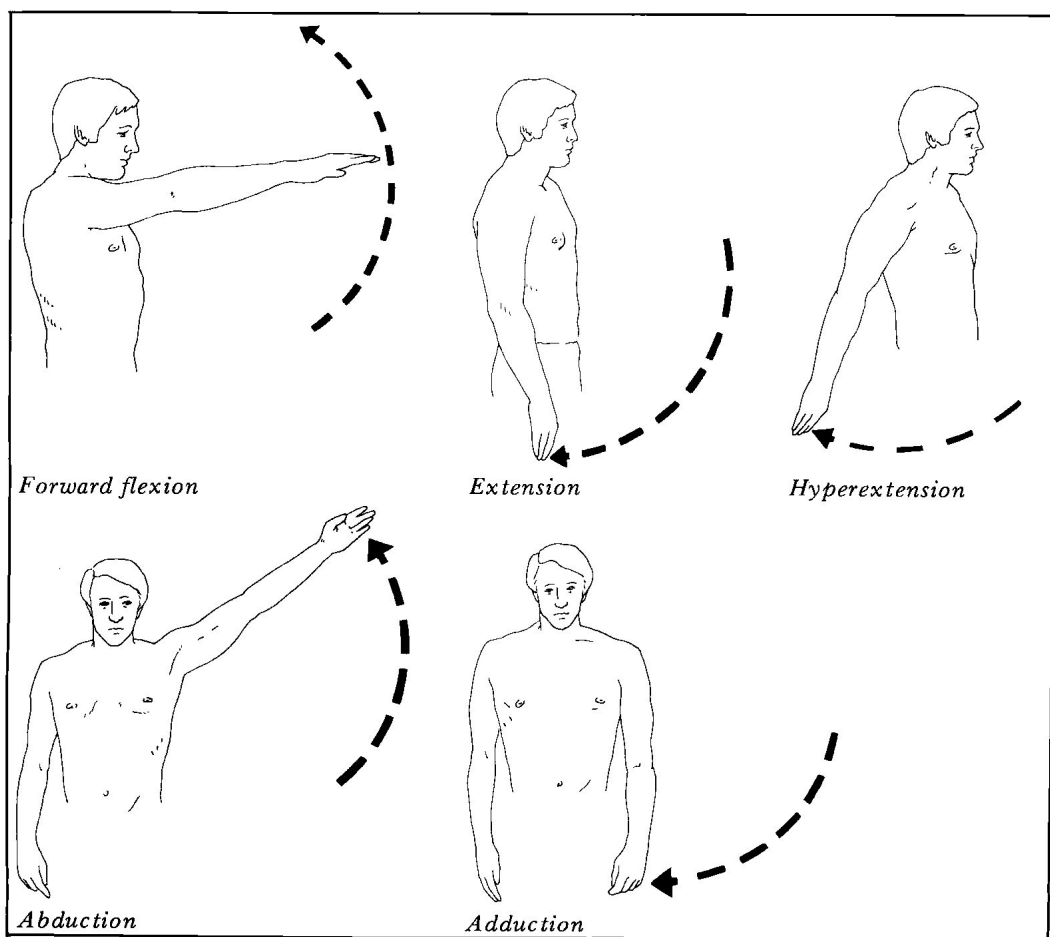
All joint motions must be identified as right or left and recorded in degrees; it should be noted whether active or passive motion has been measured. A goniometer is an instrument used to measure joint position and motion (Fig. 1-1). It is used at the elbow, for example, by placing the center of the instrument over the axis of the joint with its arms in line with the bones on each side of the joint, the elbow being in maximum extension. The position of the joint is read on the goniometer. The elbow is then maximally flexed and the new joint position is read and recorded.

The neutral position of the shoulder is with the arm at the side, the elbow extended, and the forearm in the neutral position. The shoulder is a complex joint and can move in many planes (Fig. 1-2). Even if the glenohumeral joint is stiff, motion between the scapula and chest can give overall motion of the arm and the ability to lift the arm out to the side. The position of internal rotation is with the forearm across the body, and external rotation is movement of the forearm on the shoulder axis out to the side. The ability to raise the arm overhead, straight out to the side, is combined abduction, and



*Figure 1-1. A goniometer is used to measure elbow joint motion.*

*Figure 1-2. Range of motion in the shoulder.*



the ability to do this by raising the arm forward is flexion. From a practical standpoint, the nurse should note the ability or lack of ability of the patient to put the hand behind the back; (limited internal rotation is an early sign of pericapsulitis); the ability of the patient to rotate the arm out to the side; (limited external rotation may be a sign of posterior shoulder dislocation or capsulitis); and the patient's ability or inability to raise the arm overhead (which may indicate painful joint, rotator cuff injury, bursitis, or paralysis).

The elbow is in a neutral, or 0-degree, position when it is absolutely straight. If the elbow extends past this neutral position, it is in hyperextension, also referred to as recurvatum. Flexion of the elbow is determined by measuring the number of degrees between the upper arm and the forearm with the elbow completely bent (Fig. 1-3). A flexion deformity of the elbow (elbow does not fully extend) is determined by measuring the number of degrees between the upper arm and the forearm with the elbow in maximum extension.

The forearm is in a neutral, or 0-degree, position when the arm is at the side, the elbow flexed to 90 degrees, and the forearm in a position with the back of the thumb facing up. Pronation and supination are the ability of the patient to turn the palm up (supination) or down (pronation) (Fig. 1-3). These motions can be accomplished by the shoulder; therefore, the evaluation is valid only when measurements are taken with the elbows fixed at the side.

The wrist is in a neutral position when the palm is facing down and the radius and metacarpals are in a straight plane (Fig. 1-4). Dorsiflexion is the motion of raising (extending) the entire hand up as far as possible past the neutral position, and palmar flexion is bending the hand down from the wrist past the neutral position; in both cases the number of degrees between the forearm and metacarpals is recorded. Ulnar deviation is the motion of the hand from the wrist to the outside (ulnar side) of the arm and is measured as the number of degrees between the long finger metacarpal and the forearm. Radial deviation is the motion of the hand from the wrist to the inside (radial side) of the arm and is also measured as the number of degrees between the long finger metacarpal and the forearm (Figs. 1-5, 1-6).

The hip is in a neutral, or 0-degree, position when the thigh is aligned with the trunk in all planes. Measurements are generally performed with the patient supine. Flexion of the hip is determined by bringing the thigh as close to the trunk as it will go, allowing the knee to bend (Fig. 1-7). The number of degrees between the thigh and the trunk represents hip flexion. Abduction is the movement of the hip away from the midline. It is measured from the neutral joint position and

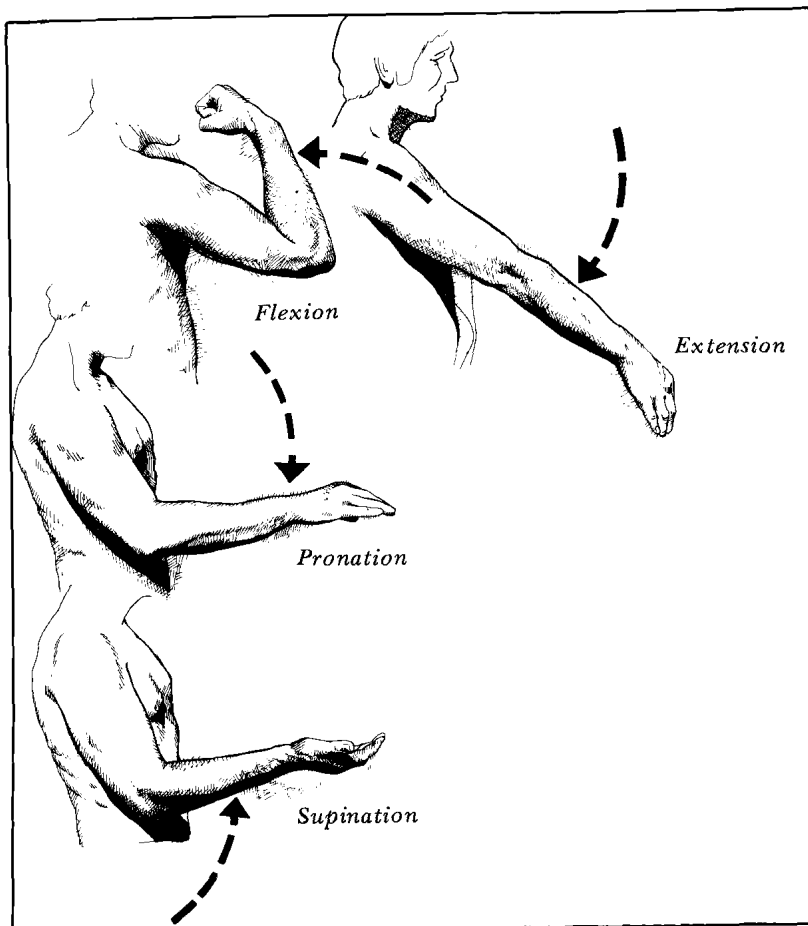


Figure 1-3. Range of motion in the elbow.

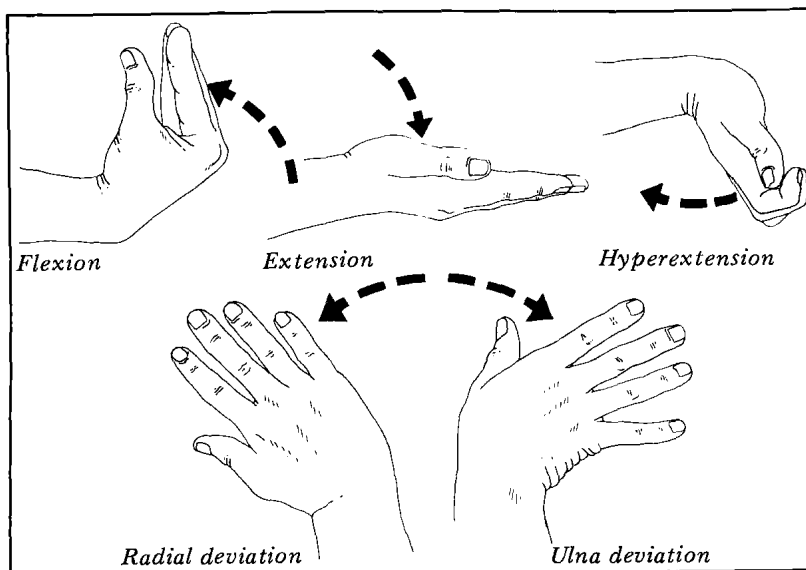


Figure 1-4. Range of motion in the wrist.

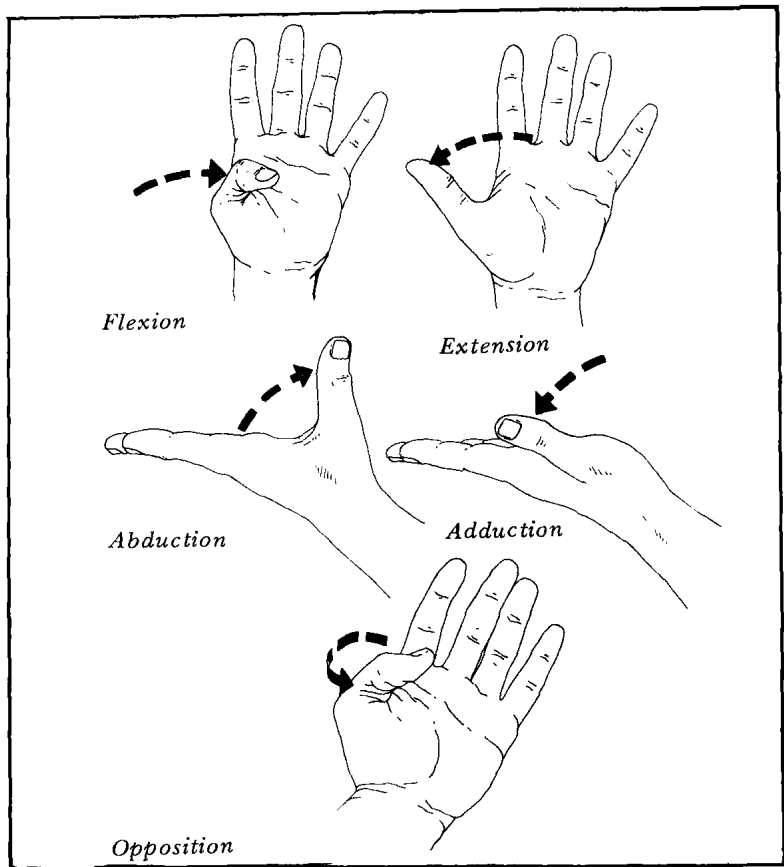


Figure 1-5. Range of motion in the thumb.

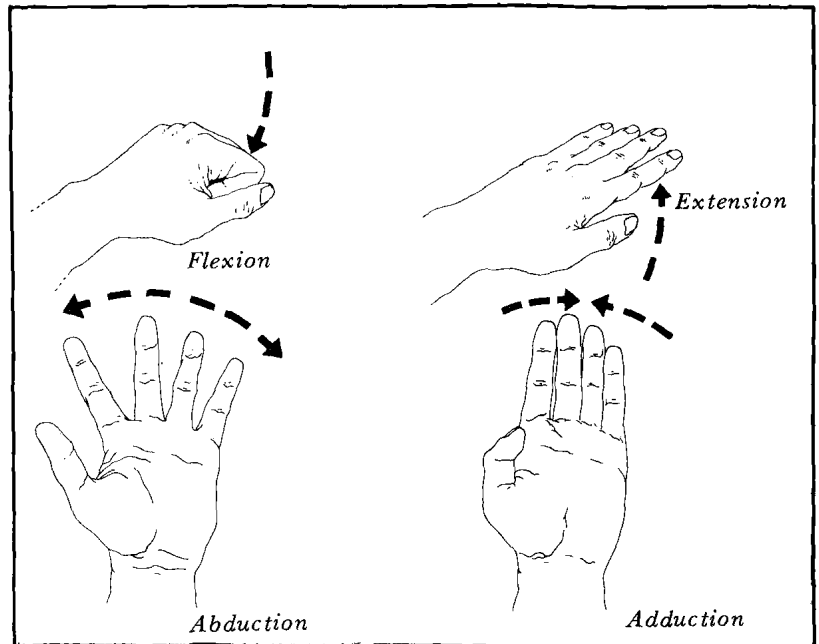
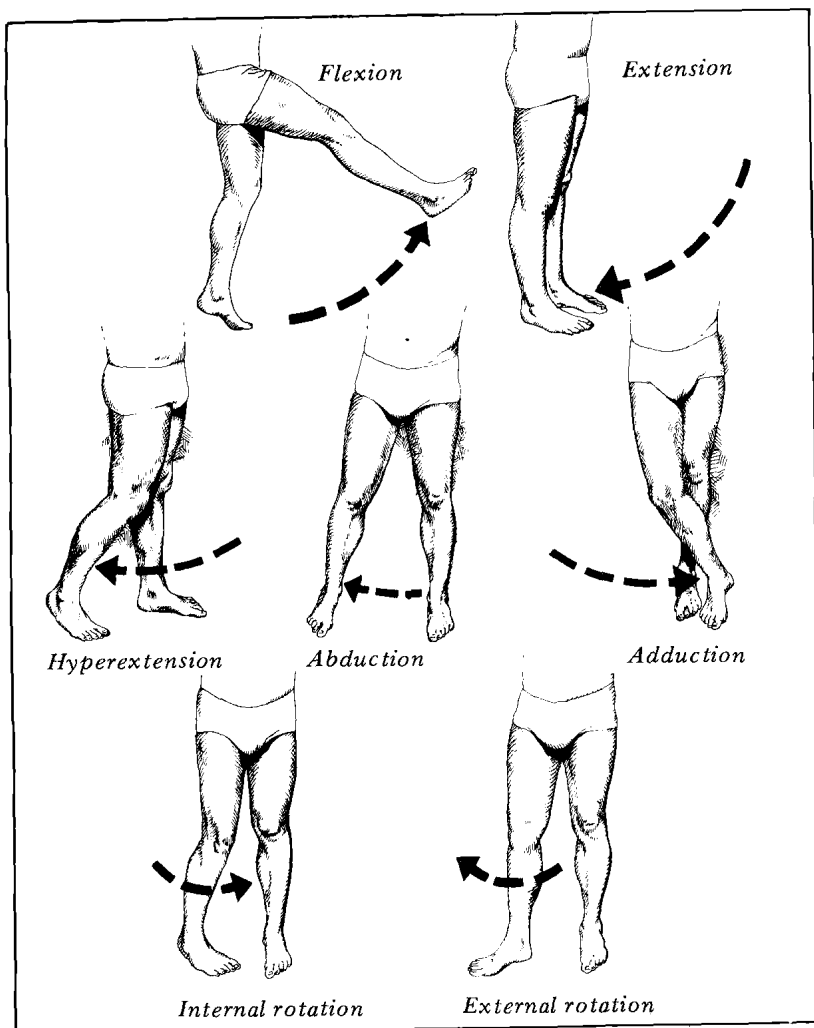


Figure 1-6. Range of motion in the fingers.





*Figure 1-7. Range of motion in the hip.*

may be recorded as abduction (number of degrees) in flexion or abduction in extension. Adduction is the movement of the thigh toward the midline. It is measured from the neutral joint position and may be recorded as adduction (number of degrees) in flexion or adduction in extension. Internal rotation is a measurement of the number of degrees that the hip will rotate toward the midline from the neutral position. It may be measured both in flexion and in extension. External rotation is a measurement of the number of degrees that the hip will rotate away from the midline from the neutral position and may also be measured both in flexion and in extension. A flexion contracture of the hip is demonstrated by first flexing the opposite hip toward the trunk, so that the back and pelvis are flat on the examining table. If the thigh lies on