Physical Therapy Protocols

Guidelines for Rehabilitation

As developed by the University of Texas Medical Branch Department of Physical Therapy

Edited by Janet Bezner, M.S., P.T., and Helen Rogers, M.A., P.T.

Physical Therapy Protocols

Guidelines for Rehabilitation

As developed by the University of Texas Medical Branch Department of Physical Therapy

Edited by Janet Bezner, M.S., P.T., and Helen Rogers, M.A., P.T.

Contributors

Janet Bezner, M.S., P.T. John A. Carney, P.T. Karen Chapman, P.T. Monica Chuong, M.A., P.T. Manuela Giannini, Ph.D., P.T. Virginia Lloyd, P.T. Pamela Ritzline, M.S., P.T. Helen Rogers, M.A., P.T. Cheryl Sharp, P.T. Karen Wheatley, M.S., P.T. Dana Wild, P.T. Karen Zeek, P.T.



a division of The Psychological Corporation 555 Academic Court San Antonio, Texas 78204-2498 1-800-228-0752

Reproducing Pages from This Book

Many of the pages in this book may be reproduced for instructional or administrative use (not for resale). To protect your book, make a photocopy of each reproducible page. Then use that copy as a master for photocopying.

Copyright © 1991 by Therapy Skill Builders

a division of The Psychological Corporation

555 Academic Court San Antonio, Texas 78204-2498 1-800-228-0752

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

Permission is hereby granted to reproduce the pages so indicated in this publication in complete pages, with the copyright notice, for administrative use and not for resale.

The Learning Curve Design is a registered trademark of The Psychological Corporation.

Printed in the United States of America

ISBN 0761681280

10 9 8 7

Table of Contents

Introduction				•	•			•	÷	•				•	÷	•	•					•	•	•	•	•		•	•	•					V	1
--------------	--	--	--	---	---	--	--	---	---	---	--	--	--	---	---	---	---	--	--	--	--	---	---	---	---	---	--	---	---	---	--	--	--	--	---	---

Neurology

Cerebrovascular Accident	ξ.	Ťe,	• •	×	•	•	•		. 3
$CerebrovascularAccident/Rehabilitation . \ . \ .$						į.			. 9
Guillain-Barré	4,		• •		•	•			17
Head Injury			• •	•	•	•			23
Paraplegia		• •		1	•	•			31
Peripheral Nerve Injury of the Hand—Outpatient		• •				•			39
Quadriplegia				•	×	•	•		43
Post Lumbar Laminectomy or Diskectomy		•		•	÷	•	ę.		51
Spinal Instrumentation for Scoliosis	γ.				÷			• •	55
Spinal Cord Injury/Rehabilitation	• •	• •		·	•	•	•		61

Orthopedics

Ankle Fracture							75
Ankle Sprain				,			79
Anterior Cruciate Ligament Repair or Reconstruction	•	•		•		•	83
Anterior Shoulder Dislocation				•			89
Arthroscopic Meniscectomy							91
Cervical or Lumbar Injury							95
Extensor Malalignment					•		99
Extensor Realignment			•				101
Femur Fracture with Open Reduction Internal Fixation							105
Femoral Neck Fracture							109
Nonarthroscopic Meniscectomy			,				113
Posterior Cruciate Ligament Repair or Reconstruction	•			÷	•		117
Radial Head Nondisplaced Fracture	•		•		•		121
Sacro-Iliac Pain			•				123
Shoulder Impingement Syndrome	•		•				127
Shoulder Reconstruction							131

Temporomandibular Joint Pain					•	•		•	•					•						135
Total Hip Arthroplasty		•			•		·		•	•	ŝ					ì		۰.		141
Total Knee Arthroplasty			•	•	•	•	•	•	•		•	•	•		•		•		•	145

Pediatrics

Newborn Spina Bifida	
Nonorganic Failure to Thrive	155
Pediatric Hemophilia	
Premature Baby	
Spina Bifida Outpatient Clinic Screening	

Miscellaneous

Adult Outpatient Diabetes Education			•	•	187
Above-the-Knee Amputation					193
Below-the-Knee Amputation				÷	197
Burn					201
Iontophoresis					207
Rheumatoid Arthritis	đ	•	•	•	211
Weight Management	ļ		•	•	215
Hydrotherapy			•		217

Additional Information

Guidelines for Wh	iee	lcl	na	ir	E	va	ιlι	ıa	tie	on	a	n	d	A	cq	ui	si	tic	on	L				•	•	225
Ambulation Aids		•		÷	•						•	·	•			•			•	•	•	•	•			231

Introduction

The University of Texas Medical Branch Hospital's Department of Physical Therapy consists of eight separate units that serve the inpatient needs of the John Sealy Hospital, the Child Health Center, the Rehabilitation Unit, the Texas Department of Criminal Justice Hospital, and the Geriatric Unit. We provide outpatient services to the Geriatric Day Hospital and the Ambulatory Care Center. Our staff includes physical therapists, physical therapist assistants, and supportive staff, for a total of thirty patient care providers. We are a teaching institution and routinely train affiliating students from physical therapy programs all over the country. Our clinical education needs, our large volume and variety of patients, and the periodic turnover of staff have led us to establish standards of care based on diagnostic categories. To create these standards, we developed a set of protocols in conjunction with the physicians from each specific medical team. Protocols are made available to all patient-care personnel and are revised regularly to accommodate changes in surgical and treatment techniques.

In addition, our facility has used the protocols as an orientation tool. Students, new staff members, and staff members rotating to new areas use the protocol book as an aid to developing proficiency in the treatment of specific patients or as a guide for the development of new programs. Basically, the protocols provide an outline of the initial evaluation, acute care, outpatient care, and equipment/referral concerns for specific conditions. They have been designed as a guide rather than a prescription, and they have been useful to our facility as a foundation for patient treatment.

By publishing *Physical Therapy Protocols: Guidelines for Rehabilitation*, we hope to provide useful information covering a wide variety of diagnostic categories of interest to physical therapy professionals. The broad topic areas are neurology, orthopedics, pediatrics, and miscellaneous and include the types of disorders that we routinely treat and we believe are commonly treated by physical therapists. (Refer to the Table of Contents for specific protocols.)

The protocols may be used to establish treatment guidelines for new patient populations, as a guide to formalizing current treatment procedures, as an orientation tool for staff or students, as a teaching tool in the educational setting, or as a way to review or refresh your memory if you have been away from a certain area for a long time.

In addition, we have included several forms developed by our department to streamline documentation. These forms have made our documentation more efficient, and we find they facilitate the retrieval of information from the medical record for peer review and research purposes.

In using these protocols in your facility, we recommend that you consult physicians and other health professionals with whom you work and modify the protocols to best meet your specific needs. We hope you discover, as we have, that treatment protocols improve the quality of care you provide.





Cerebrovascular Accident Protocol

Objectives

- I. Maximize total functional ability of the patient.
- II. Promote maximum independence.
- III. Assist patient with management of home situation and provision of necessary equipment.
- IV. Educate patient's family on the treatment program and risk factors.
- V. Investigate home situation and coordinate discharge planning with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate (Cerebrovascular Accident/Head Injury Evaluation form follows protocol.)
 - A. Range of motion
 - 1. Assess lower extremity and upper extremity on involved side, with emphasis on range of motion needed for functional activities (bed mobility, transfers, gait).
 - 2. Assess joint integrity and determine presence or absence of shoulder subluxation on the involved side.
 - B. Strength
 - 1. Evaluate patient's voluntary movement in involved extremities and trunk.
 - 2. Assess gross strength of uninvolved extremities.
 - C. Functional ability. Evaluate bed mobility, movement to sitting and in sitting, transfers, wheelchair management and mobility, and gait ability.
 - D. Neurological
 - 1. Examine the patient's tone in extremities and trunk.
 - 2. Assess movement patterns to determine whether normal or abnormal synergy patterns are present.
 - 3. Assess for presence or absence of deep tendon reflexes, clonus, Babinski, or other abnormal reflexes.
 - 4. Examine coordination, sensation, and proprioception of extremities and trunk bilaterally.
 - E. Gait
 - 1. Assess patient's ability to come to stand and progress into gait.
 - 2. Evaluate for deviations from normal and need for postural support (walker or cane) versus orthotic support (for weak extremities).
 - F. Respiration. If applicable, assess for deficits limiting functional ability.

- G. Cardiovascular. Assess blood pressure, heart rate, and vascular compromise for deficits limiting functional ability.
- H. Skin and soft tissue. Determine the presence of edema (or asymmetry of extremity girth), lesions, or decubitus in the trunk and extremities.
- I. Posture
 - 1. Examine for asymmetry in the upper and lower trunk and upper and lower extremities.
 - 2. Examine for asymmetry in extremity weight bearing in all applicable positions (supine, sitting, and stance).
- J. Assess previous functional level of patient as an aid in determining realistic goals.
- K. Review family situation for determination of home program and other discharge needs.
- L. Assess need for consultation to other ancillary services, outpatient physical therapy, or rehabilitation.
- M. Re-evaluate patient on a weekly basis.
- II. Precautions during evaluation
 - A. Cardiovascular limitations may render patient unable to tolerate an increase in physical activity beyond bed exercises or movement to an upright position. (This is most often a concern post aneurysm.)
 - B. Patient may have poor awareness of injury, resulting in a tendency to be careless of involved side, impulsive, and unsafe with movements.
 - C. Effect of tone (especially hypotonia) may result in need to modify treatment (for example, to protect a subluxed shoulder).
 - D. Unrealistic expectations and psychosocial complications may affect patient's cooperation and motivation in therapy.

Treatment/Goals

- I. Frequency: Patient is to be seen five days a week and Saturday, if appropriate.
- II. Treatment techniques and goals
 - A. **Treatment:** Provide passive, active-assistive, and active range of motion to lower extremities and upper extremities.

Goals: Establish functional lower extremity and upper extremity range of motion for gait and transfers.

B. Treatment: Provide proprioceptive neuromuscular facilitation exercises.

Goals: Increase strength and control of lower extremities, trunk, and upper extremities for gait and transfer.

- C. Treatment:
 - 1. Training toward independent function, including rolling, coming to sit, wheelchair transfer (pivot or sliding), and coming to standing position.
 - 2. Train patient in independent management of and mobility in wheelchair.

Goals: Increase functional ability pertaining to transfer, bed mobility, and sitting; establish functional mobility.

D. **Treatment:** Facilitate or inhibit muscle tone by positioning, use of neurodevelopmental techniques, use of equilibrium reflexes, rocking, rotation, tapping, brushing, stroking, vibration, weight bearing, or adding resistance to normal side.

Goals: Normalize any abnormal tone present in upper and lower extremity; maximize patient's ability with transfers and gait.

E. Treatment:

- 1. Initiate gait training, including assessment of the type of assistance patient requires: cane, walker, orthosis, or other.
- 2. Train with proper assistive device if applicable.

Goal: Independent gait with or without assistive device.

F. Treatment:

- 1. Educate patient on skin breakdown and effects of decreased sensation.
- 2. Teach patient proper positioning and alignment.

Goals: Prevent decubitus formation; increase patient's awareness of body.

- G. Treatment: Develop proper home program to include the following:
 - 1. Training of family in proper treatment techniques.
 - 2. Communication with social services regarding equipment requirements of patient.
 - 3. Arrangements for further outpatient physical therapy or rehabilitation, if indicated.

Goal: Ensure continuity of care upon discharge.

III. Precautions during treatment

- A. Avoid activities that increase abnormal tone; support joints in the event of subluxation from low tone.
- B. Be alert to sensory deficits.
- C. Be alert to cardiovascular response to upright position and physical exercise.
- D. Don't present patient with unrealistic expectations of final level of function.
- IV. Equipment. Equipment needs will vary among patients depending on their neurological deficit, but typical equipment may include the following:
 - A. Hemiwalker or quad (4-point) cane
 - B. Wheelchair (assess for seat height needs)
 - C. Ankle foot orthosis
 - D. External upper extremity support for shoulder subluxation (if necessary)

Discharge

- I. Evaluation: Complete final assessment of patient's functional level.
- II. Follow up plan/referral. Follow-up on outpatient therapy or rehabilitation recommendations.
- III. Home program
 - A. Educate family on exercise, transfer, and gait assistance needs.
 - B. Consider home environment when projecting patient's need for equipment or continued therapy.
 - C. Provide adequate written information.

Patient Example

Patient is a 57-year-old female with right hemiparesis post left CVA. Upon evaluation, patient was noted to roll to the right independently but required moderate assistance to roll to the left. Patient was unable to effectively scoot up in bed.

Goal: (1 week) Patient will be able to roll to both sides and to scoot in bed independently.

Cerebrovascular Accident/Head Injury Evaluation Request for Consultation and Report

ame		D.O.B.	
ddress			
Physician or Service			
ison for requesting consultation—pre	ecautions and related factors		
		Deeper	
nature (Physician)	EXT#	Beeper Date	9
General Impression			
Diagnosis		Age	
Admission date	Previous functi	ional level	
HISTORY			
Bange of motion limitations			
Banne of motion limitations			
Muscle function (active movement)			
Muscle function (active movement)	scale) 4 – Minimum assistance requir 5 – Supervision	red 7 – Complete independence	<u> </u>
Functional Ability (Use numerical s 1 Total assistance required 2 Maximal assistance required 3 Moderate assistance required	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence	red 7 – Complete independence	<u>}</u>
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence	red 7 – Complete independence	<u>}</u>
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting	red 7 – Complete independence	}
Muscle function (active movement) Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone	red 7 – Complete independence	
Functional Ability (Use numerical s 1 Total assistance required 2 Maximal assistance required 3 Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone	red 7 – Complete independence)
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board	red 7 – Complete independence	, ,
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	red 7 – Complete independence	3
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	red 7 – Complete independence	, ,
Functional Ability (Use numerical s 1 Total assistance required 2 Maximal assistance required 3 Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	red 7 – Complete independence)
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	red 7 – Complete independence	, ,
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	red 7 – Complete independence	, ,
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board	red 7 – Complete independence	}
Muscle function (active movement) Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Pressure relief	red 7 – Complete independence	; ;
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Pressure relief Forward	red 7 – Complete independence 	, , ts
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Pressure relief Forward	red 7 – Complete independence 	, , ts
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Pressure relief Forward	red 7 – Complete independence	, , ts
Functional Ability (Use numerical s 1 - Total assistance required 2 - Maximal assistance required 3 - Moderate assistance required Bed Mobility	scale) 4 – Minimum assistance requir 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Pressure relief Forward Assistance	red 7 – Complete independence	, ts

Coording 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280

OrientationAbility to to Sensation Light touch Deep touch Hot/cold	llow commands
Sensation Light touch Deep touch Hot/cold	
Light touch Deep touch Hot/cold	
Deep touch	Sharp/dull
Hot/cold	Proprioception
	Kinesthesia
Reflexes	
DTR	Clonus
Babinski	Associated reaction
Tone	Movement pattern
Coordination	Finger to nose
Tandem walking	Heel to shin
Braiding	Figure eight
Braiding	
Carolac/Respiratory Status	
Blood pressure	Heart rate
Ventilator dependent?	
Yes No	
Skin/Soft Tissue	
Skin condition	Location of pressure sores
Edema	
Posture	
Sitting	Standing
Sunine	
Short-Term Goals (Time Frames:)
Long-Term Goals (Time Frames:)
3	······································
Plan	

Copyright @ 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280

Cerebrovascular Accident/Rehabilitation Protocol

Objectives

- I. Assist the survivor of a CVA to achieve the maximum level of functional independence at home and in the community.
- II. Provide education on safety considerations and risk factors pertinent to CVA.
- III. Assist patient and family with provision of necessary equipment and adaptations to maximize independence.
- IV. Assist with referral to appropriate funding agencies, support groups, and outpatient physical therapy as needed.
- V. Provide home program education to patient and family, including information on exercise needs (specifically, range of motion, strengthening, and contracture prevention).
- VI. Coordinate discharge planning with other members of rehabilitation team, patient, and family.

Admission/Evaluation

- I. Areas to evaluate (Cerebrovascular Accident/Head Injury Evaluation form follows protocol.)
 - A. Range of motion
 - 1. Evaluate active and passive range of motion bilaterally.
 - 2. Note presence of tightness, pain with range of motion, or subluxation of involved shoulder.
 - B. Strength
 - 1. Evaluate active movement and note range actively completed on involved side. Avoid making precise measurements or adding resistance on involved side, due to possible tonal concerns.
 - 2. Perform gross manual muscle test on uninvolved side.
 - C. Functional ability
 - 1. Assess bed mobility.
 - 2. Assess transitional movements of supine to sitting and sitting to supine.
 - 3. Assess static and dynamic sitting balance.
 - 4. Examine movement in sitting, wheelchair mobility, and operation of wheelchair parts.
 - 5. Evaluate sit-to-stand transfers, standing balance, wheelchair transfers, and gait ability as appropriate.
 - 6. Note abnormal movement patterns or tonal influences with movement and positioning.

- D Neurological
 - 1. Assess patient's tone, reflexes, coordination, sensation, and movement quality in extremities and trunk.
 - 2. Note changes with positioning and movement.
- E. Gait
 - 1. Evaluate patient's movement during pregait activities, sit to stand, and gait.
 - 2. Assess patient's quality of movement, weight-shifting ability, control of balance, and symmetry.
 - 3. Evaluate standing balance and need for postural support.
 - 4. An assessment of orthotic needs may be necessary to improve gait.
- F. Cardiac/respiratory. Note any factors that are potentially limiting to function.
- G. Skin and soft tissue. Examine patient for presence of edema, decubitus, or differences in extremity girth.
- H. Posture
 - 1. Assess symmetry, noting shortening or elongation of trunk and dynamics of trunk motion.
 - 2. Note changes from sitting to standing posture.
- I. Review objectives.
 - 1. Discuss home program and discharge needs with family.
 - 2. Coordinate referrals to other disciplines.
- II. Precautions during evaluation
 - A. Physical limitations of patient are possible secondary to hypertension or unstable neurological status. (These situations should be resolved prior to beginning rehabilitation.)
 - B. Patient's poor proprioception may result in unilateral neglect, impulsivity, and poor safety judgment.
 - C. Patient may require support for involved extremities in presence of subluxation or increased tone.
 - D. Patient's poor awareness of extent of injury may lead patient and family to set unrealistic goals.

Treatment/Goals

- I. Frequency. Patient is to be seen twice a day, with formal re-evaluation monthly.
- II. Treatment techniques and goals (Treatment activities and time necessary to reach goals vary widely based on severity of CVA and hemisphere involved.)
 - A. Treatment: Perform range of motion exercises daily.

Goal: Achieve full functional range of motion of all joints.

B. **Treatment:** Instruct patient in operation of wheelchair parts and propulsion techniques.

Goal: Achieve independent wheelchair mobility and operation.

C. **Treatment:** Establish rolling pattern to both sides that includes symmetrical dissociation of shoulder and pelvis.

Goal: Achieve independent bed mobility with normalized pattern of movement.

D. **Treatment:** Instruct patient in progression to sitting from supine (and return) with progression through sidelying first.

Goal: Establish independent symmetrical pattern of motion.

E. Treatment:

- 1. Establish functional sitting balance: grade 4 (good) to 5 (normal). (See Sitting Balance Definitions following protocol.)
- 2. Progress to elicitation of equilibrium reactions in both sides of trunk.

Goal: Attain functional trunk control for sit-to-stand transfer.

F. Treatment:

- 1. Progress to maintaining an erect trunk and anterior pelvic tilt in short sitting.
- 2. Develop patient's ability to maintain alignment as forward movement in sitting occurs.

Goal: Attain functional, dynamic trunk stability for sit-to-stand transfer.

G. **Treatment:** Progress to sit-to-stand activities by establishing the patient's ability to bring weight forward over the feet, extending first at the knees, then at the hips.

Goal: Achieve symmetrical, independent sit-to-stand transfers.

H. **Treatment:** Establish functional static standing balance. Patient must maintain an even weight-bearing pattern without pelvic retraction.

Goal: Establish necessary symmetry for proper stance phase.

I. Treatment:

- 1. Begin weight-shifting activities in standing.
- 2. Initiate side-to-side weight shifting.
- 3. Progress until patient is stabilizing pelvis bilaterally.
- 4. Progress to weight shifting into stride weight bearing. Begin with uninvolved leg first to improve unilateral weight bearing on involved leg (that is, stance leg) and to facilitate graded release of stance leg extension.
- 5. Progress to placing affected leg ahead by practicing movement forward and back, into and out of swing phase initiation.

Goal: Establish symmetrical swing and stance phases.

J. **Treatment:** Begin gait in parallel bars. Emphasize forward motion of patient's tibia over foot at midstance to increase stability of stance phase.

Goal: Establish as normal a gait pattern as possible.

K. **Treatment:** Progress to gait with quad cane or hemiwalker without an exaggerated weight shift to either side during stance.

Goal: Establish maximal level of stability in gait.

L. Treatment:

- 1. Establish household (150 feet) or community (500 feet) ambulatory status.
- 2. If patient is to be a community ambulator, teach ambulation on uneven surfaces, grass, ramps, curbs, and stairs (at least 6 inches).

Goal: Attain independent gait.

M. **Treatment:** Instruct patient in getting down to and up from the floor. If patient is unable to be independent with this skill, instruct patient in crawl or drag technique for self-help.

Goal: Ensure independent safety skills in the event of fall or emergency.

- III. Precautions during treatment
 - A. Treatments and goals (G) through (L) may not be realistic for some patients. Modify progressions for lower-level patients or patients whose gait pattern is difficult to correct.
 - B. Time frames vary widely from two weeks to two or three months, based on patient ability and spontaneous recovery following CVA.
 - C. Support upper extremities in the event of subluxation during standing and gait activities.
 - D. Support patient as needed and take care to maintain good alignment with stance and gait to avoid unnecessary increases in tone.
 - E. Guard patient well if impulsivity or poor safety judgment is evident.
- IV. Equipment. Needs will vary among patients.
 - A. Generally, a patient who is not a high community ambulator (that is, can manage only one to two blocks) will need a wheelchair and ambulation aid, as appropriate.
 - B. A patient who is making progress with gait may want to consider renting rather than purchasing a wheelchair.
 - V. General considerations
 - A. Patient and family should be independent with a home program of range of motion exercises, and pelvic, upper extremity, and lower extremity strengthening exercises prior to discharge.
 - B. Assist family and patient in financial and emotional considerations (refer to support groups, funding sources, and outpatient programs) as appropriate.

Discharge

- I. Evaluation
 - A. Compare patient status at discharge with admission status, emphasizing functional muscle strength, range of motion, tone/reflex status, functional ability, and pregait/gait skills.
 - B. If patient is still dependent on a wheelchair to any degree, assess patient's independence with the wheelchair and ability to instruct others in its use.

- II. Follow-up plan/referral
 - A. Coordinate discharge plans, equipment acquisition, and referrals with other members of the rehabilitation team.
 - B. Arrange for delivery of equipment or assist with provision of loaned equipment, as necessary.
 - C. Establish means of communication with patient following discharge.

Patient Example

Patient is a 63-year-old male with left hemiparesis secondary to a right CVA. Patient is able to propel his wheelchair using his right arm and leg but cannot maintain direction. Patient continually runs into walls and doorways on the left.

Goal: (1 week) Patient will maintain propulsion in a straight line for 50 feet.

Sitting Balance Definitions

Test position:	Patient in short or long sitting.
Normal (5):	Patient maintains sitting test position statically for three minutes; adjusts position when balance is disturbed or during dynamic movements by use of trunk equilibrium reactions without using upper extremities.
Good (4):	Patient maintains sitting test position statically for two minutes, adjusts position when balance is disturbed or during dynamic movements by use of protective reactions using upper extremities.
Fair (3):	Patient maintains test position statically for one minute; unable to adjust position without falling when balance disturbed. Patient can reach for object dynamically only by maintaining balance with opposite extremity, or can reach only forward and backward during dynamic movement.
Poor (2):	Patient unable to maintain test position, maintains sitting balance using hands to prop self. Unable to move in sitting without external support and assistance.
Zero (0):	Flaccid, requires maximal assistance to assume or maintain sitting.



Patient #			
lame		D.O.I	3.
Address			
Physician or Sorvico	<u>2</u> 3		
ason for requesting consultation—prec	cautions and related factors		
nature (Physician)	Ext #	Beeper	Date
General Impression			
Diagnosis	·	Age	
Admission date	Previous fund	ctional level	
History			
Muselo function (active mevement)			
Functional Ability (Use numerical sc	cale)		
1 – Total assistance required	4 – Minimum assistance requ	uired 7 - Complete ind	ependence
2 – Maximal assistance required	5 – Supervision		
3 – Moderate assistance required	6 – Modified independence		
Bed Mobility			
Rolling to left	Supine to sitting		
Rolling to right	Rolling to prone		
Bed/Wheelchair Transfers			
Manages equipment	Sliding with board		
Stand pivot	Sliding without board		
Transitional Movements—Transfers			
Sit to stand—Quality			
Stand to sit. Quality			
Sitting Balance			
Stand to sh-county Sitting Balance Short Sitting	Static Balance	Dynamic Balance	
Stand to sit—cutaity Sitting Balance Short Sitting Wheelchair Mobility	Static Balance	Dynamic Balance	
Stand to sit—cutanty Sitting Balance Short Sitting Wheelchair Mobility Position in chair	Static Balance Pressure relief	Dynamic Balance Management of whe	elchair parts
Stand to sit—cutaity Sitting Balance Short Sitting Wheelchair Mobility Position in chair Propulsion	Static Balance Pressure relief Forward	Dynamic Balance Management of whe Backward	elchair parts
Statul to sit—cutality Sitting Balance Short Sitting Wheelchair Mobility Position in chair Propulsion Calt	Static Balance Pressure relief Forward	Dynamic Balance Management of whe Backward	elchair parts
Stand to sit—cutanty Sitting Balance Short Sitting Wheelchair Mobility Position in chair Propulsion Gait	Static Balance	Dynamic Balance Management of whe Backward	elchair parts
Stand to sit—cutality Sitting Balance Short Sitting Wheelchair Mobility Position in chair Propulsion Turns GaitEquipment Analysis of pattern/guality	Static Balance	Dynamic Balance Management of whe Backward	elchair parts

Copyright © 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280

OrientationAbility to follow Isation Light touch Deep touch Hot/cold lexes DTRBabinski Babinski Tone Coordination Banding Grandem walking Gra	commands Sharp/dullProprioceptionKinesthesiaKinesthesiaKinesthesiaKinesthesiaKinesthesiaAssociated reactionMovement patternFinger to noseHeel to shinFigure eightKinesthesiaKi
Isation Light touch Deep touch Hot/cold Hexes DTR Babinski Tone Coordination Tandem walking Braiding diac/Respiratory Status Blood pressure titlator dependent? Yes No n/Soft Tissue Skin condition Edema sture Sitting Supine sessment	Sharp/dull Proprioception Kinesthesia Clonus Associated reaction Movement pattern Finger to nose Heel to shin Figure eight Heart rate Location of pressure sores Standing
Light touch Deep touch Hot/cold Hot/cold Iexes DTR Babinski Tone Coordination Tandem walking Braiding diac/Respiratory Status Blood pressure titlator dependent? Yes Yes n/Soft Tissue Skin condition Edema sture Sitting Supine	Sharp/dull Proprioception Kinesthesia Clonus Associated reaction Movement pattern Finger to nose Heel to shin Figure eight Heart rate Location of pressure sores Standing
Deep touch	ProprioceptionKinesthesia Kinesthesia Associated reaction Movement pattern Finger to nose Heel to shin Figure eight Heart rate Location of pressure sores Standing
Hot/cold	Kinesthesia Clonus Associated reaction Movement pattern Finger to nose Heel to shin Figure eight Heart rate Location of pressure sores Standing
Iexes DTR	ClonusAssociated reaction Movement pattern Finger to nose Heel to shin Figure eight Heart rate Location of pressure sores Standing
DTR	ClonusAssociated reaction Movement pattern Finger to nose Heel to shin Figure eight Heart rate Location of pressure sores Standing
Babinski	Associated reaction Movement pattern Finger to nose Heel to shin Figure eight Heart rate Location of pressure sores Standing
Tone	Movement pattern Finger to nose Heel to shin Figure eight Heart rate Location of pressure sores Standing
Coordination	Finger to nose Heel to shin Figure eight Heart rate Location of pressure sores Standing
Tandem walking	Heel to shin
Braiding	Figure eight Heart rate Location of pressure sores Standing
diac/Respiratory Status Blood pressure	Heart rate
Blood pressureNoNoNoNoNoSkin conditionSture SittingSture SittingStureStureSessmentSessmentSessment	Heart rate
ntilator dependent?YesNo n/Soft Tissue Skin condition Edema sture Sitting Supine sessment sessment prt-Term Goals (Time Frames: Ig-Term Goals (Time Frames:)	Location of pressure soresStanding
YesNo n/Soft Tissue Skin condition Edema sture Sitting Supine sessment prt-Term Goals (Time Frames:	Location of pressure soresStanding
n/Soft Tissue Skin condition	Location of pressure sores
Skin condition Edema	Location of pressure sores
Edema	Standing
sture Sitting	Standing
SittingSupineSessment	Standing
Supine	
sessment	
ort-Term Goals (Time Frames:	
ng-Term Goals (Time Frames:)
Ig-Term Goals (Time Frames:	······································
Ig-Term Goals (Time Frames:	
ng-Term Goals (Time Frames:	
Ig-Term Goals (Time Frames:	
ng-Term Goals (Time Frames:	
ng-Term Goals (Time Frames:	
)
	/
an suite and sui	
n	
nature	
Somioo	

Copyright © 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280

Guillain-Barré Protocol

Objectives

- I. Assist patient to regain optimal neurological functioning.
- II. Plan treatment program to allow optimal recovery (extent and rate) with minimal complications.
- III. Restore and maintain full range of motion of all extremities.
- IV. Assist patient to regain maximum muscle strength.
- V. Keep skin intact.
- VI. Prevent contractures.
- VII. Promote maximum independence in activities of daily living.
- VIII. Assist patient and family to cope with lengthy rehabilitative process.
 - IX. Investigate home situation and coordinate discharge planning with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate
 - A. History
 - 1. Onset, duration, and progression of disease
 - 2. Previous medical history
 - 3. Current lifestyle
 - B. Range of motion. Assess both active and passive range of motion of all major joints of the upper and lower extremities during gross motor activities. (See Precautions during Evaluation and Treatment.)
 - C. Motor skills
 - 1. Use specific manual muscle test (to distinguish weakness versus paralysis), including assessment of cranial nerve function.
 - 2. During acute phase, consult physician prior to muscle testing. (Testing may be delayed until stabilization phase.)
 - D. Functional ability. Assess gross motor skills and activities of daily living, with special emphasis on bed mobility and transfer ability.
 - E. Neurological
 - 1. Test specific dermatome levels of sensation including sensory component of cranial nerves I, V, and VII-X. Assess proprioceptive and kinesthetic senses.
 - 2. Assess tone, reflexes, and movement abnormalities.
 - 3. Begin ongoing assessment of neurological status.

- F. Gait (if applicable). Observe characteristics of gait, noting balance, stability, equipment used, and need for assistance.
- G. Skin and soft tissue. Note lesions, decubiti, edema, or atrophy.
- H. Posture. Assess and note asymmetry due to weakness or lack of stability.
- I. Related services. Assess need for other services (such as occupational therapy, dietary, speech, or psychology).
- J. Respiratory
 - 1. Observe patient for dyspnea or fatigue.
 - 2. Note whether patient requires ventilator assistance.
- K. Cardiac. Assess applicable areas.
- II. Precautions during evaluation and treatment
 - A. Overexertion and patient fatigue during testing may cause or increase the demyelination process and caloric depletion. Initially, exercise may need to be limited to passive range of motion. If active range of motion is done, movement should be limited to one or two repetitions.
 - B. Support bony prominences to prevent tactile pressure if tenderness or pain is present over muscle bellies.
 - C. Avoid possible joint dislocation or subluxation during range of motion secondary to supportive tissue weakness.
 - D. Avoid overstretching weakened muscles.
 - E. Use close guarding techniques during all transfers and exercise involving weak areas.
 - F. Beware of autonomic dysreflexia (rapid increase in blood pressure due to autonomic nervous system malfunction) and be prepared to intervene.
 - G. Note symptoms of possible deep vein thrombosis.
 - H. Be prepared for psychosocial changes secondary to severity of disease.
 - I. Compensate for orthostatic hypotension during transfers and upright activities.
 - J. Re-evaluate neurological status, muscle strength, and range of motion *weekly*, noting areas of progress or change.

Treatment/Goals

- I. Frequency
 - A. See patient at least once a day.
 - B. Increase treatment time based on patient tolerance and at your discretion.
- II. Treatment techniques and goals
 - A. Acute phase (continuing neurological dysfunction)
 - 1. **Treatment:** Perform passive range of motion only to all extremities (within limits of pain).

Goals: Maintain full passive range of motion of all extremities; prevent contractures.

2. Treatment: Begin proper bed positioning.

Goals: Prevent skin breakdown secondary to pressure areas or contracture formation; assist with mobilization of respiratory secretions.

3. Treatment: Use desensitization techniques.

Goal: Decrease complaints of pain and muscle tenderness from dysesthesia.

4. **Treatment:** Educate patient and family about disease process and rehabilitative activities.

Goal: Provide positive attitude toward recovery for the patient and family.

- B. Stabilization phase (neurological stability without return of function)
 - 1. **Treatment:** Continue acute phase treatment techniques of bed positioning, desensitization, and patient/family education.

Goals: Same as in acute phase

2. **Treatment:** Progress exercise from passive range of motion, to active-assistive range of motion, to active range of motion movements as tolerated by patient (avoid overexertion and fatigue).

Goal: Attain highest possible level of functional muscle strength.

3. Treatment: Begin gentle stretching of lower extremity muscle groups.

Goal: Achieve full muscle flexibility, especially in hamstrings and gastrocnemius for performance of functional activities.

- C. Recovery phase (return of function)
 - 1. **Treatment:** Continue acute and stabilization phase treatment techniques and goals, if applicable.
 - 2. Treatment:
 - a. Progress exercise to active-resistive range of motion, functional skills training, and strengthening exercises for upper and lower extremities and trunk.
 - b. Develop upper extremity strength for transfers, mobility, balance, weight shifting, pressure relief, and preparation for coming to stand during lower extremity return.

Goals: Attain maximum muscle strength and functional independence.

3. Treatment: Begin sitting and upright activities on mat, wheelchair, or tilt table.

Goals: Increase upright tolerance; improve balance and stability of trunk.

4. Treatment: Teach weight shifting, rolling, and skills for bed mobility.

Goal: Establish independent rolling and weight shifting.

5. Treatment: Begin transfer training.

Goals: Achieve independent mobility within the limits of neurological injury; prevent skin breakdown.

6. **Treatment:** Instruct patient in wheelchair mobility and maintenance (if applicable).

Goal: Ensure independent and safe wheelchair mobility in the household and the community.

- 7. Treatment: Assess equipment needs and recommend necessary equipment. Goal: Facilitate functional independence.
- 8. **Treatment:** Begin gait training (if applicable) with necessary assistive devices. **Goal:** Attain independent and safe ambulation on level surfaces and stairs.
- 9. **Treatment:** Continue upper and lower extremity strengthening exercises, progressing to resistive exercise and/or aerobic (endurance) exercise if able.

Goal: Attain maximum muscle strength, function, and endurance.

- III. Equipment. Patients may vary in neurological return and will need individual assessment. Typical equipment includes the following:
 - A. Ankle-foot orthoses
 - B. Wheelchair
 - C. Sliding board
 - D. Bathroom adaptive aids
 - E. Walker, crutches, or cane
- IV. General considerations
 - A. Increase upper and lower extremity strength and endurance for functional activities.
 - B. Coordinate treatment with other health-care team members.
 - C. Evaluate patient motivation.
 - D. Consider psychosocial aspects.
 - E. Assist with financial situation.
 - F. Consider home environment and need for continued outpatient physical therapy or rehabilitation upon discharge.

Discharge

- I. Evaluation
 - A. Determine which goals have been achieved.
 - B. Note status of patient at discharge.
 - C. Coordinate discharge with other support services.
- II. Follow-up plan/referral
 - A. If patient has significant residual weakness, refer patient to home-health services or outpatient physical therapy at least three to four times a week.
 - B. For patient with mild weakness, a home exercise program may be sufficient.
- III. Home program
 - A. Provide written exercise program for strength, range of motion, and endurance of upper and lower extremities.
 - B. Educate patient and family in use of the program.

Patient Example

Patient is a 25-year-old male status post onset of Guillain-Barré. Patient is neurologically stable at present but continues to require assistance with ventilation. He has been cleared for physical therapy to begin range of motion exercises but continues to be in the acute phase of his disease.

Goal: (1 week) Nurses and patient's family will demonstrate bed positioning program established by therapist.

Head Injury Protocol

Objectives

- I. Minimize joint and muscle abnormalities caused by prolonged immobilization.
- II. Facilitate nursing care by instructing patient in bed mobility and transfer skills.
- III. Assist patient in regaining functional skills, particularly related to mobility, strength, and coordination.
- IV. Assist physician in monitoring changes in neurological function.
- V. Involve and educate family in appropriate exercise programs.
- VI. Investigate home situation and coordinate discharge planning with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate (Cerebrovascular Accident/Head Injury Evaluation form follows protocol.)
 - A. General impressions
 - 1. Date of injury
 - 2. Associated injuries and functional or orthopedic limitations.
 - 3. Intracranial pressure ranges
 - 4. Family support
 - B. Range of motion
 - 1. Note range of motion and patterns of restricted movement. Include trunk mobility (especially lumbar/pelvic rotation).
 - 2. Cervical mobility may not be tested if ventriculostomy or Richmond bolt is present.
 - 3. Specific measurements may be noted for hamstrings, gastrocnemius and biceps muscles, and shoulder flexion.
 - C. Muscle strength
 - 1. Note active movement through full or partial range of motion.
 - 2. Note presence or lack of voluntary movement and control. Note presence of movement to command.
 - D. Functional abilities
 - 1. Type of feeding
 - 2. Presence of upper extremity function sufficient to pull out nasogastric tube or catheter
 - 3. Amount of assistance needed with bed mobility and transfers
 - 4. Developmental/functional skills

- E. Gait. Address symmetry, coordination, degree of extension in stance (including head, trunk, and lower extremities), and need for support.
- F. Neurological status
 - 1. Glasgow Coma Scale
 - a. Assess current responsive state; motor responses will be partially determined by awareness.
 - b. The best motor response need be achieved only on one side.
 - 2. Sensation. Sensitivity to pain, hot/cold, deep touch, and proprioception should be assessed in the feet, hands, trunk, and face.
 - 3. Muscle tone
 - a. Spasticity. Indications are presence of clonus, Babinski, and clasp knife reflexes, and deep tendon reflexes which are 3+ or 4+ (overflow associated with other pyramidal tract signs).
 - b. Rigidity. Indications are lack of clonus, resistance throughout passive range of motion regardless of speed of movement, and absent deep tendon reflexes.
 - c. Normal tone. Patient assists with movement in all planes. Deep tendon reflexes are 2+.
 - d. Hypotonia. Indications are lack of clonus, little or no resistance to passive range of motion, possible hypermobility. Deep tendon reflexes are 0 or 1+.
 - e. Fluctuating tone. Usually a form of rigidity. Note ranges of muscle tone.
 - i. "Mixed" fluctuates within high range.
 - ii. "True" fluctuates within low range.
 - iii. "Dystonic" fluctuates from low to high tone.
 - 4. Motor control. Evaluate quality of movement.
 - 5. Reflexes. See Table 1.
 - 6. Intracranial pressure (ICP). Assess change in ICP (noted from monitor) with exercise or movement in bed.

Table 1. Evaluation of Reflexes

Reflex	Stimulus	Positive Response
Facial avoidance	Stroke side of face near mouth.	Turns head away, closes mouth.
Rooting	Stroke side of face near mouth.	Turns head toward you, opens mouth.
ATNR	Turn head to side.	Extensor tone increases on jaw side; flexor tone increases on skull side.
Babinski	Stroke sole of foot along medial side.	Toes go up and fan.

Reflex	St imulus	Positive Response
Tonic labyrinthine reflex	Patient in supine	Extensor tone increases throughout body.
	Patient in sidelying	Flexor tone in extremities resting on bed; extensor tone in other extremities.
Associated movements	Patient squeezes hand.	Tone increases in other parts of body.

- G. Respiratory
 - 1. Consider need for ventilator support, tracheostomy, or intubation.
 - 2. Observe notations regarding infection, air movement, and frequency of suctioning or administration of oxygen by face mask or ventilator.
- H. Cardiac. Note changes in heart rate and blood pressure with exercise. Compare with preinjury levels.
- I. Postural alignment
 - 1. Evaluate supine, sidelying, and sitting postures.
 - 2. Note difficulty in maintaining positions.
 - 3. Note extremity postures present in multiple positions (plantar flexion, adduction, and shoulder extension).
- J. Skin and soft tissue. Note presence of edema, cyanosis, bruises, incisions, or pressure areas.
- K. Determine need for consultation by other services.
- II. Precautions during evaluation
 - A. Generally patient's head must be kept elevated in the intensive care unit.
 - 1. Shunted hydrocephalus
 - a. Maintain head elevated at least 30° above horizontal.
 - b. Avoid prolonged pressure over shunt or shunt bubble.
 - c. Patient remains on bed rest three to four days postoperatively.
 - 2. Ventriculostomy/Richmond bolt
 - a. Patient must be maintained at specified heights in bed. Bed height should not be altered without approval of patient's nurse.
 - b. Minimize head movements.
 - c. Normal intracranial pressure is 9. Avoid activities that raise intracranial pressure above 16 to 20. Physician orders should be checked for maximum allowable intracranial pressure.
 - 3. Arterial lines. Changes in position of extremity can alter pressure readings. Don't range the joint nearest area in which the catheter is inserted.

- 4. Other tubes and lines. Take care to avoid dislodging any line or tube when lowering bedrails or moving patient.
- 5. Restraints
 - a. All patients should be left in the position in which they were found, with restraints securely fastened.
 - b. Disoriented patients should not be left unattended unless appropriately restrained with bedrails raised.
- 6. Foley catheters. The tape holding the tubing to patient's leg frequently must be loosened to do hip range of motion. Reattach tape after exercise or notify patient's nurse.

Treatment/Goals

- I. Frequency
 - A. Patients on drug paralysis for management of ICP are to be seen three to five times per week to assess for return of tone.
 - B. Patients with abnormal tone or impaired function are to be seen five to six days per week. Twice-a-day treatments may be indicated if progress is being made and goals are being achieved.
- II. Treatment techniques and goals
 - A. **Treatment:** Provide passive, active-assistive, and active range of motion to all extremities, neck, and trunk.

Goal: Prevent loss of motion and strength which may later impair functional activities.

B. **Treatment:** Introduce patient to sitting in wheelchair or on edge of mat with legs in a posture of 90° at hip, knees, and ankles.

Goals: Improve tolerance for upright position; normalize extensor tone in trunk; maintain range of motion in ankles, hips, and knees; provide weight bearing.

C. Treatment: Initiate therapeutic exercises.

Goals: Enhance normal patterns of movement; increase strength.

D. **Treatment:** Train patient toward independent function, including wheelchair, tub, and commode transfers; use of wheelchair; and use of assistive device for ambulation.

Goal: Achieve independent transfers and ambulation in the presence of neurological dysfunction.

E. **Treatment:** Use facilitation and inhibition techniques such as positioning, use of equilibrium reactions, reflexes, rocking, joint rotation, brushing, stroking, vibration, weight bearing, vestibular stimulation, electrical stimulation, and casting.

Goals: Normalize muscle tone; improve patterns of movement; regain motor skills; increase orientation/alertness.

F. **Treatment:** Progress through a developmental sequence: prone skills, rolling, sitting, quadruped, kneeling, standing, transitional movements, and ambulation.

Goals: Improve control of trunk, head, and extremities; normalize muscle tone; improve functional strength.

G. Treatment: Establish positioning program.

Goals: Prevent loss of range of motion secondary to maintenance of abnormal postures; position in wheelchair to optimize upper extremity function, trunk and head alignment, and respiration; prevent skin breakdown due to prolonged pressure.

H. **Treatment:** Educate patient, family, and nursing staff in exercises, positioning, and precautions.

Goals: Continue appropriate therapeutic activities in the daily living situation; increase speed of recovery; prevent secondary problems.

- III. Precautions during treatment
 - A. Review precautions relating to head position for patients in intensive care.
 - B. Inappropriate behavior by patient may necessitate use of restraints and very close supervision.
 - C. Associated deficits in auditory, visual, and verbal processing require staff communication and cooperation with other disciplines.
- IV. Equipment. Patient needs vary widely for this population, possible considerations include the following:
 - A. Wheelchairs, possibly with seating systems for postural control
 - B. Environmental adaptations
 - C. Orthotic devices to improve tone, alignment, and/or function
 - D. Transfer aids (lifts to sliding boards)
- V. General considerations
 - A. Full recovery usually requires admission to a rehabilitation unit for prolonged intensive therapy. Acute-care therapy is oriented toward first achieving essential skills of daily living, such as wheelchair transfers and positioning program. Ongoing therapy will improve motor control, functional skills, and cognitive abilities.
 - B. Assess progress toward goals on a monthly basis.
 - 1. If no progress is made over a two-month period, patient will be discharged from physical therapy.
 - 2. A home program should be given to caregivers.
 - 3. If patient resumes progress, a second physical therapy evaluation may be requested.

Discharge

- I. Evaluation
 - A. Summarize activities performed and rate of progress.
 - B. Determine status of goals.
 - C. Identify remaining problems.

- II. Follow-up plan/referral
 - A. Patients with residual neurological problems should be assessed based on the rate of progress made during active therapy and on the basis of achievable goals. Seek rehabilitation services for those patients judged to need ongoing therapy.
 - B. Give a written home program to patients being discharged to their homes or to nursing homes.
 - C. Re-evaluation of discharged patients can be arranged by consultation, if appropriate.

III. Home program

- A. Include appropriate positioning programs and use of equipment.
- B. Demonstrate necessary exercises and provide in writing.

Patient Example

Patient is a 20-year-old female status post closed head injury sustained in a motor vehicle accident. Patient presents with mild to moderate cognitive and behavioral changes and dense left hemiparesis. Patient exhibits moderately increased left lower extremity extensor tone and severely increased left upper extremity flexor tone.

Goal: (1-2 weeks) Patient will independently manage wheelchair brakes and propel wheelchair for a distance of 50 feet using right upper and lower extremities.

Cerebrovascular Accident/Head Injury Evaluation Request for Consultation and Report

Name			D.O.B	
Address				
Physician or Service ason for requesting consultationprec	autions and related factors			
nature (Physician)	Ext #	Be	eeper	Date
General Impression				
Diagnosis			Age	
Admission date	Previous fund	ctional level		
History				
Range of motion limitations				
Muscle function (active movement)				
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required	ale) 4 Minimum assistance requ 5 Supervision 6 Modified independence	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility	ale) 4 Minimum assistance requ 5 Supervision 6 Modified independence	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Bolling to left	cale) 4 – Minimum assistance requ 5 – Supervision 6 – Modified independence	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Bolling to right	cale) 4 Minimum assistance requ 5 Supervision 6 Modified independence Supine to sitting Bolling to proge	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed MobilityRolling to leftRolling to right Bed/Wheelchair Transfers	ale) 4 Minimum assistance requ 5 Supervision 6 Modified independence Supine to sitting Rolling to prone	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Rolling to right Bed/Wheelchair Transfers Manages equipment	ale) 4 Minimum assistance requ 5 Supervision 6 Modified independence Supine to sitting Rolling to prone Sliding with board	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Rolling to right Bed/Wheelchair Transfers Manages equipment Stand pivot	ale) 4 – Minimum assistance requ 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Rolling to right Bed/Wheelchair Transfers Manages equipment Stand pivot Transitional Movements—Transfers	cale) 4 Minimum assistance requ 5 - Supervision 6 Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Bed/Wheelchair Transfers Stand pivot Transitional Movements—Transfers Sit to stand—Quality	cale) 4 Minimum assistance requ 5 Supervision 6 Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Rolling to right Bed/Wheelchair Transfers Manages equipment Stand pivot Transitional Movements—Transfers Sit to stand—Quality Stand to sit—Quality	ale) 4 – Minimum assistance requ 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical soc 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Rolling to right Bed/Wheelchair Transfers Stand pivot Transitional Movements—Transfers Sit to stand—Quality Stand to sit—Quality Sitting Balance	ale) 4 – Minimum assistance requ 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Rolling to right Bed/Wheelchair Transfers Manages equipment Stand pivot Transitional Movements—Transfers Sit to stand—Quality Stand to sit—Quality Sitting Balance Short Sitting	ale) 4 Minimum assistance requ 5 - Supervision 6 Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board	uired 7 – C	omplete inde	pendence
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Rolling to right Bed/Wheelchair Transfers Stand pivot Transitional Movements—Transfers Sit to stand—Quality Stand to sit—Quality Sitting Balance Short Sitting	cale) 4 Minimum assistance requ 5 Supervision 6 Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Sliding without board Rolling to protect and the second static balance Rolling to protect and the second static balance	uired 7 – C	omplete inde	
Muscle function (active movement) Functional Ability (Use numerical so 1 – Total assistance required 2 – Maximal assistance required 3 – Moderate assistance required Bed Mobility Rolling to left Rolling to right Bed/Wheelchair Transfers Stand pivot Transitional Movements—Transfers Sit to stand—Quality Stand to sit—Quality Stitting Balance Short Sitting Wheelchair Mobility Position in chair	ale) 4 – Minimum assistance requ 5 – Supervision 6 – Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Pressure relief	uired 7 – C	omplete inde	pendence
Muscle function (active movement)	ale) 4 Minimum assistance requ 5 Supervision 6 Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Pressure relief Forward	uired 7 – C	omplete inde	pendence
Muscle function (active movement)	cale) 4 Minimum assistance requ 5 Supervision 6 Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Pressure relief Forward	uired 7 – C	omplete inde	pendence
Muscle function (active movement)	ale) 4 Minimum assistance requ 5 Supervision 6 Modified independence Supine to sitting Rolling to prone Sliding with board Sliding without board Sliding without board Pressure relief Forward Assistance	uired 7 – C	omplete inde	pendence

Unertation	Ability to tollow commande
Sensation	Ability to follow commands
Light touch	Sharo/duli
Deep touch	Proprioception
Hot/cold	Kinesthesia
Reflexes	
DTR	Clonus
Babinski	Associated reaction
Tone	Movement pattern
Coordination	Einger to nose
Tandem walking	Heel to shin
Braiding	Figure eight
Cardiac/Respiratory Status	
Blood pressure	Heart rate
Ventilator dependent?	
Ves	No
Skin/Soft Tissue	
Skin condition	l ocation of pressure sores
Edema	
Posture	
Sitting	Standing
Sunine	
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:))
Short-Term Goals (Time Frames:))
Short-Term Goals (Time Frames:))
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:)))
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:)
Short-Term Goals (Time Frames:	
Paraplegia Protocol

Objectives

- I. Assist patient with spinal cord injury (SCI) below level T1 to achieve the maximal level of functional independence and to prepare for rehabilitation or discharge.
- II. Educate and orient patient and family on precautions and discharge treatment programs, with emphasis on maintenance of functional independence.
- III. Investigate home situation and coordinate treatment and discharge planning with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate (Spinal Cord Injury Evaluation form follows protocol.)
 - A. Range of motion. Evaluate passive and active range of motion of upper and lower extremities.
 - B. Manual muscle test. Test and specifically grade strength of upper and lower extremities.
 - C. Functional ability. Evaluate balance, coming to sit, bed mobility, weight shift, ability to achieve pressure relief, and preparation for stance, if indicated.
 - D. Posture. Evaluate posture in supine and sitting.
 - E. Neurological
 - 1. Evaluate sensation, including gross evaluation of upper extremity sensation and dermatomal evaluation of lower extremity and trunk.
 - 2. Examine proprioception, kinesthetic sensation, changes in muscle tone, reflexes, and movement abnormalities.
 - 3. Begin ongoing assessment of functional level.
 - F. Assess need for involvement of other ancillary services.
- II. Precautions during evaluation
 - A. Log roll patient only until physician indicates that patient is stable.
 - B. Avoid manual muscle test of trunk unless approved by physician.
 - C. Joint pain, limitation of motion, swelling, or heat around major weight-bearing joints may indicate heterotrophic ossification or deep vein thrombosis and may require the attention of a physician.
 - D. Re-evaluate patient weekly to assess the extent of neurological injury or change in status. Frequency of re-evaluation should be reconsidered when patient is out of neurological intensive care unit or off bed rest.

Treatment/Goals

I. Frequency. Patient should be seen a minimum of one time per day.

- II. Treatment techniques and goals
 - A. Patient is restricted to bed and is pain-free.

Treatment: Begin progressive resistive exercises to upper extremities with weights or therapeutic exercises while in supine.

Goals: Increase upper extremity strength; improve function for bed mobility, weight shift, pressure relief, and preparation for coming to sit.

- B. Patient is cleared by physician for out-of-bed activity.
 - 1. **Treatment:** Begin sitting and upright activities in wheelchair to increase tolerance for upright position. Progress to sitting activities on the edge of the mat.

Goals: Increase tolerance for upright position; improve balance in sitting.

- 2. Treatment:
 - a. Aggressively strengthen upper extremities, lower extremities, and trunk.
 - b. Increase upper extremity strength and endurance with transfers, mobility skills, balance activities, weight shifting, pressure relief, and preparation for coming to stand.

Goals: Increase upper extremity and trunk strength and balance for effective functional ability, protection of skin/soft tissue, and development of independence.

3. Treatment: Begin muscle re-education at level appropriate to deficit.

Goal: Obtain as much muscle return as possible to assist in previously listed functional abilities.

4. **Treatment:** Gently stretch lower extremity muscle groups. Instruct patient in self range of motion.

Goal: Achieve full muscle length, particularly in gastrocnemius and hamstring muscles, to effectively carry out above-stated functional activities.

- 5. Treatment:
 - a. Teach weight shifting and rolling.
 - b. Progress to balance in long sitting and wheelchair pushups.

Goal: Achieve independent weight shifting, rolling, and long sitting.

- 6. **Treatment:** Initiate transfer training and assist with obtaining proper equipment. **Goal:** Ensure safe, independent wheelchair, toilet, and tub transfers.
- 7. Treatment: Instruct patient in wheelchair management, mobility, and safety.
 - a. Include instruction in operation of wheelchair parts and mobility on level surfaces and ramps, and introduction to technique for wheelies.
 - b. Progress to negotiating curbs and various surfaces.

Goal: Maneuver wheelchair independently and safely in household and community.

8. **Treatment:** Assess wheelchair needs if patient is not going to rehabilitation setting.

Goal: Obtain a wheelchair specifically suited to the needs of each patient.

9. **Treatment:** Assess patient for reciprocating brace, long leg braces, or orthotic devices and begin gait training with equipment if patient is not going to rehabilitation setting.

Goal: Achieve functional or physiological ambulation through the use of braces.

10. **Treatment:** Develop skin-care program, educate patient on pressure areas and how to relieve them.

Goals: Prevent skin breakdown; educate patient and family on magnitude of problem; promote effective preventive measures.

- C. Patient is cleared by physician for more extensive rehabilitation.
 - 1. **Treatment:** Progress to transfer training to and from uneven surfaces (for example, to floor or car), with emphasis on safety and balance.
 - 2. **Treatment:** Progress to independent negotiation of architectural barriers: bedroom, bathroom, curbs, heavy doors, stairs if able, and community ambulation if applicable.
 - 3. Treatment: Begin ambulation activities if indicated by level of spinal cord injury.
 - 4. **Treatment:** Work on full hamstring and lower extremity stretching, establish patient independence in self range of motion program.

Goal: Achieve maximal level of functional independence.

- III. Precautions during treatment
 - A. Orthostatic hypotension may be common during initial sitting trials.
 - B. Autonomic dysreflexia may be present in patients with SCI at level T6 and above.
 - 1. Symptoms include severe headaches, sweating, red blotchy skin, and behavioral changes.
 - 2. Symptoms may occur rapidly and are caused by any painful condition (for example, kinked urinary catheter, bowel impaction, severe urinary tract infection, or malposition of extremities).
 - 3. Treat patient by quickly dropping blood pressure (sit up rapidly), and look for causes.
 - 4. Autonomic dysreflexia may be a life-threatening situation because a sudden rise in blood pressure may be sufficient to cause a CVA.
 - C. Consistently evaluate skin for onset of skin breakdown, and be prepared to initiate treatment/positioning changes immediately.
 - D. Clear all activities with physician if there is any doubt about appropriateness for the patient.
 - E. Harrington rod stabilization between T3 and L5 may be performed to provide distraction or compression.
 - 1. If rods are attached to pelvis, do not flex hips above 90°.
 - 2. Do not rotate trunk in any case.
 - 3. All patients should have body jacket or cast prior to beginning work in sitting.
- IV. Equipment. Each patient has individual needs, but most will require a wheelchair and shower chair.

- V. General considerations
 - A. Advise physician to order abdominal binder or corset for lower body support to improve respiratory efficiency.
 - B. Recommend changes in seating system to correct for asymmetrical postures.
 - C. Provide vascular support to lower extremities during standing or sitting activities to avoid hypotension.
 - D. Always recommend a rehabilitation consult.
 - E. Consult occupational therapy regarding adaptive equipment.
 - F. Consider the effects of the following factors on patient recovery and compliance:
 - 1. Financial status
 - 2. Home or post-discharge situation
 - 3. Motivation and cognition, family support, and patient expectations
 - 4. Availability of needed braces and equipment
 - 5. Luque rods (L-Rods) are used for stability only, no treatment restrictions exist.

Discharge

- I. Evaluation
 - A. Coordinate discharge planning with occupational therapy, nursing, and social services.
 - B. Determine which goals have been reached and patient's status at discharge as compared to onset of disability.
 - C. Evaluate patient progress, with emphasis on specific muscle grades, neurological findings, and functional abilities.
- II. Follow-up plan/referral
 - A. Arrange for home-health physical therapy or outpatient physical therapy.
 - B. Refer patient to support groups, community resources, and vocational resources.
- III. Home program
 - A. Include upper extremity, trunk, and lower extremity strengthening and stretching, with emphasis on maintaining gross mobility skills.
 - B. Provide skin-care program to educate patient on the importance of pressure relief over bony prominences.
 - C. Identify resource center for equipment and maintenance needs.

Patient Example

Patient is a 30-year-old female who presents with T10 paraplegia sustained in a motor vehicle accident. Patient exhibits no functional sensory or motor function below the level of her injury. Patient has been stabilized with rods from T8 to L1 and is cleared to begin out-of-bed activities by her physician.

Goal: (1 week) Patient will tolerate upright sitting to 90° in a wheelchair for 30 to 45 minutes three times a day and upright sitting on a mat for 15 minutes at a time.

Spinal Cord Injury Evaluation

	• · · ·	· · · · ·		
atient #				
lame			D.O	.В.
ddress				
Physician son for reque	or Service esting consultation—precautio	ns and related ractors		
ature (Physi	cian)	Ext #	Beeper	Date
General Imp	ression			
Jiagnosis			Age	
Admission da	ate			
istory				-
	<u> </u>			
	tion limitations			
hange of mo				
Strength (Ma	inual Muscle Test)		BIGHT	1 EET
	Upper trapezius	Scapular elevation		
C5	Middle deltoid	Shoulder abduction		
	Biceps	Elbow flexion		
	Pectoralis maior (C5-C8)	Horizontal adduction		+
C6	Extensor carpi radialus	Radial wrist extension		
C7	Extensor carpi ulnaris	Ulnar wrist extension		
	Flexor carpi radialus	Radial wrist extension		-
	Triceps	Elbow extension		
	Extensor digitorum longus	Finger extension		_
C8	Flexor carpi ulnaris	Ulnar wrist flexion		
-	Flexor digitorum	Finger flexion		
T1	J			1
T1-T10	Intrinsics	Finger adduction/abduction		
T1-T10	Intrinsics Abdominals	Finger adduction/abduction Trunk flexion		
T1-T10	Intrinsics Abdominals Erector spinae	Finger adduction/abduction Trunk flexion Trunk extension		
T1-T10	Intrinsics Abdominals Erector spinae Quadratus lumborum	Finger adduction/abduction Trunk flexion Trunk extension Pelvic elevation		
T1-T10	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas	Finger adduction/abduction Trunk flexion Trunk extension Pelvic elevation Hip flexion		
T1-T10 L1 L2	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors	Finger adduction/abduction Trunk flexion Trunk extension Pelvic elevation Hip flexion Hip adduction		
T1-T10 L1 L2 L3	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps	Finger adduction/abduction Trunk flexion Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension		
T1-T10 L1 L2 L3 L4	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis	Finger adduction/abduction Trunk flexion Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion		
T1-T10 L1 L2 L3 L4	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings	Finger adduction/abduction Trunk flexion Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion Knee flexion		
T1-T10 L1 L2 L3 L4 L5	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings	Finger adduction/abductionTrunk flexionTrunk extensionPelvic elevationHip flexionHip adductionKnee extensionAnkle dorsiflexionKnee flexionKnee flexion		
T1-T10 L1 L2 L3 L4 L5	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings Gluteus medius	Finger adduction/abduction Trunk flexion Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion Knee flexion Hip abduction		
T1-T10 L1 L2 L3 L4 L5	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings Gluteus medius Posterior tibialis	Finger adduction/abductionTrunk flexionTrunk extensionPelvic elevationHip flexionHip adductionKnee extensionAnkle dorsiflexionKnee flexionKnee flexionHip abductionAnkle inversion		
T1-T10 L1 L2 L3 L4 L5 S1	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings Gluteus medius Posterior tibialis Gluteus maximus	Finger adduction/abductionTrunk flexionTrunk extensionPelvic elevationHip flexionHip adductionKnee extensionAnkle dorsiflexionKnee flexionKnee flexionHip abductionAnkle inversionHip extension		
T1-T10 L1 L2 L3 L4 L5 S1	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings Gluteus medius Posterior tibialis Gluteus maximus Peroneals	Finger adduction/abductionTrunk flexionTrunk extensionPelvic elevationHip flexionHip adductionKnee extensionAnkle dorsiflexionKnee flexionKnee flexionHip abductionAnkle inversionHip extensionAnkle eversion		
T1-T10 L1 L2 L3 L4 L5 S1	Intrinsics Abdominals Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings Gluteus medius Posterior tibialis Gluteus maximus Peroneals Gastroc-soleus	Finger adduction/abductionTrunk flexionTrunk extensionPelvic elevationHip flexionHip adductionKnee extensionAnkle dorsiflexionKnee flexionKnee flexionHip abductionAnkle inversionHip extensionAnkle eversionHip extensionPlantar flexion		

	and the second sec
2 – Maximal assistance required	d 5 – Supervision
3 – Moderate assistance require	ed 6 – Modified independence
Bolling/bed mobility	Supine to sit
Transfer setup (manage	ement of equipment)
Transfer wheelchair to n	nat Pressure relief
Wheelchair Mobility	
Propulsion forward	Propulsion backward
Turns	
Sitting balance	
<u> </u>	
Sitting posture	
Neurological Status (See Sensor	rv Evaluation)
Sensorv	,
Sharp/dull	Light touch
Proprioception	Kinesthesia
Tone	
Reflexes	
DTR	Clonus
Babinski	
Gait (potential)	
Sit to stand	Standing balance
Cardiac/Respiratory Status	
calulac/nespiratory Status	
Skin/Soft Tissue	
Dooturo	
Posture	
Posture Supine	
Posture Supine Sitting Standing	
Posture Supine Sitting Standing	
Posture Supine Sitting Standing Assessment	
Posture Supine Sitting Standing Assessment	
Posture Supine Sitting Standing Assessment	
Posture Supine Sitting Standing Assessment	
Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: _)
Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames:))
Posture Supine)
Posture Supine	
Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames:))
Posture Supine)
Posture Supine)
Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames:	
Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	
Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	
Posture Supine	
Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan Plan Signature	
Posture Supine	



Copyright @ 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280

Peripheral Nerve Injury of the Hand— Outpatient Protocol

Objectives

- I. Facilitate return of hand function through use of exercise and modalities.
- II. Maximize benefits of rehabilitation through splinting, exercise, and activities of daily living programs directed by occupational therapist.
- III. Assist patient with financial needs by contacting social services or state financial aid agencies.

Admission/Evaluation

- I. Areas to evaluate
 - A. General impression
 - 1. Age, sex, occupation, and date of injury
 - 2. Specific etiology of nerve injury
 - 3. Any related injuries to bones, tendons, arteries, and soft tissues of the hand
 - 4. Dates and nature of surgeries
 - B. Range of motion
 - 1. Specifically measure shoulder, elbow, forearm, wrist, and MCP, PIP, and DIP joints of each digit of the hand. Assess active and passive motion.
 - 2. Test joint play motion of all joints of wrist and hand to identify need for joint mobilization.
 - C. Strength
 - 1. Assess gross muscle strength above level of nerve lesion.
 - 2. Perform specific manual muscle test below level of injury to determine muscle innervation or denervation and to identify appropriate level of reinnervation of nerve.
 - 3. Measure baseline grip strength with dynamometer, three trials at handle placements 2 and 3.
 - D. Neurological
 - 1. Evaluate cutaneous distribution of ulnar, median, and radial nerves of hand (for light touch, sharp/dull, hot/cold).
 - 2. Evaluate stereognosis, two-point discrimination, deep tendon reflexes, proprioception, and flaccidity.

- E. Skin and soft tissue
 - 1. Note condition of skin, presence of swelling, skin grafting, and scar formation.
 - 2. Note atrophy of thenar or hypothenar eminences and any soft-tissue deformity secondary to nerve damage, such as clawhand, bishop's hand, or wrist drop.
- F. Functional abilities
 - 1. Assess gross limitations in daily living activities. (Occupational therapy will evaluate specific limitations.)
 - 2. Evaluate gross ability to perform basic grasps: prehension, fingertip lateral pinch, three jawchuck, cylindrical, hook, and spherical.
 - 3. Note use of static or dynamic splints. Refer to occupational therapy for splint revision, if necessary.
- G. Gait. Note any deviation secondary to guarding of hand, specifically arm swing decrease.
- H. Posture. Note any deviation secondary to guarding of hand, specifically shoulder asymmetry.
- I. Special tests include Bunnel Littler, Retinacular, Phalen's, Guyon's, and Tinel's sign. (See Hoppenfeld, S. 1976. *Physical examination of the spine and extremities*. Norwalk, CT: Appleton-Century-Crofts.)
- II. Precautions during evaluation
 - A. Nerve, tendon, and artery repairs are generally immobilized approximately four to six weeks to protect surgical procedure.
 - B. Adequate healing must occur prior to initiation of therapy to prevent damage to the repair.
 - C. Precautions may differ among physicians. Check with consulting physician for specific precautions if not specified on consult—for example, active versus passive motion.

Treatment/Goals

- I. Frequency. See outpatients at least three times a week.
- II. Treatment techniques and goals
 - A. Treatment: Apply ice and elevate for pain control and swelling, if necessary.

Goal: Decrease pain and edema.

B. **Treatment:** If no swelling is present, use hot pack, paraffin bath, or whirlpool prior to exercise, stretching, and mobilization.

Goals: Increase circulation; decrease pain; promote muscle relaxation.

C. **Treatment:** Apply ultrasound to hand using continuous cycle under water and to scar site on pulsed cycle as tolerated.

Goals: Increase circulation; decrease pain and hypertrophic scar formation; promote relaxation prior to stretching and mobilization.

D. **Treatment:** Use friction massage or electric vibrator on scar. Use lanolin cream to prevent skin breakdown.

Goal: Decrease hypertrophic scar formation.

- E. Treatment: Electrical stimulation
 - 1. Galvanic (DC). Use probe, applying brief stimulus to elicit twitch contraction in denervated muscles.
 - 2. High voltage/high frequency. Use on weakened innervated muscles with approximate 1:3 ratio of on/off time.

Goals: Decrease atrophy of denervated muscles; provide active joint motion; increase strength of weakened muscles; promote tendon gliding.

- F. Treatment: Initiate manual exercise.
 - 1. Begin active and active-assistive range of motion exercises; progress to resistive range of motion exercises.
 - 2. Perform passive range of motion and stretching with physician approval.
 - 3. Begin joint mobilization with grades I and II; progress to grades III and IV.

Goals: Increase strength, soft tissue extensibility, and joint motion; decrease pain in joints.

G. **Treatment:** Apply TENS during or after exercise for pain control and for areas of hypersensitivity.

Goals: Decrease pain; promote use of hand.

H. **Treatment:** Use intermittent compression pump for one hour at low pressure (25 to 40 mmg) on 2:1 intermittent cycle.

Goal: Decrease edema.

III. Precautions during treatment

- A. Use care in treating areas of decreased sensation to prevent burning during heat treatments (hot packs, paraffin, and whirlpool).
- B. Check with physician regarding adequate scar healing and remodeling before massaging and applying ultrasound.
- C. Use care to prevent burns during galvanic (DC) electrical stimulation treatment. Apply only brief stimulus to elicit twitch contraction.
- D. Check with physician regarding specific precautions for nerve, tendon, or artery repairs, and for advisability of active versus passive motion.
- E. Use care when performing passive range of motion or mobilization during TENS treatment.
- F. Use foam or padding to protect fracture, pins, MCP and ICP arthroplasty, and equipment during compression pump treatment.
- G. Avoid straining, fatigue, or overexertion.
- H. Each hand injury is different and involves various nerves, tendons, and arteries. Ask the physician for precautions pertinent to specific injury.

IV. Equipment

- A. Cold packs, hot packs, paraffin bath, small whirlpool, TENS unit, ultrasound, and electrical stimulators
- B. A portable galvanic unit may be acquired for daily home use on denervated muscles.
- C. Splints and assistive devices for daily living activities may be fabricated by occupational therapy.

Discharge

- I. Evaluation. Note range of motion, strength, sensation, condition of skin and soft tissue, and level of function of hand.
- II. Follow-up plan/referral. Occupational therapy may assist patient to return to work or develop new occupation.
- III. Home program
 - A. Provide patient with specific exercise program for range of motion and strengthening.
 - B. Provide instruction on the use of home electrical stimulation unit, if applicable.

Patient Example

Patient is a 21-year-old female presenting with a peripheral nerve injury to right hand after a severe laceration four weeks ago. Patient is now four weeks post surgical repair with complaints of pain at level 7 on a scale of 1 to 10 and moderate edema of right hand.

Goals: (2-4 weeks)

- 1. Decrease pain to 4 on a scale of 1 to 10 and decrease edema to minimal (with use of cryotherapy and elevation).
- 2. Decrease hypertrophic scar formation (with use of friction massage).

Quadriplegia Protocol

Objectives

- I. Assist patient with spinal cord injury, level C2 to C7, to achieve maximal level of functional independence within limitations of injury.
- II. Increase patient's sitting endurance, general strength, and wheelchair endurance; provide instruction on wheelchair transfers in the acute setting.
- III. Monitor and report physical and neurological status of the patient to physician on a weekly basis.
- IV. Coordinate and consult with other health disciplines as needed.
- V. Assess patient for equipment needs and recommend or order as appropriate.
- VI. Educate patient and family on precautions, transfer assistance, and treatment programs needed for discharge.

Admission/Evaluation

- I. Areas to evaluate (Spinal Cord Injury Evaluation form follows protocol.)
 - A. Range of motion. Evaluate active and passive range of motion of all extremities (see Precautions during Evaluation).
 - B. Muscle strength. Evaluate strength in residual muscle groups using specific manual muscle tests.
 - C. Posture. Assess position in bed and chair and type of cervical stabilization utilized by physician.
 - D. Neurological. Examine tactile sense, proprioception, sharp/dull sensation, muscle tone, Babinski, clonus, and deep tendon reflexes.
 - E. Skin and soft tissue. Examine for lesions or atrophy.
 - F. Functional abilities. Initiate ongoing assessment of functional level.
- II. Precautions during evaluation
 - A. Some movements of neck or upper extremities may be contraindicated if cervical stabilization has not yet been completely achieved.
 - 1. Do not range shoulders above 90° unless cleared by physician.
 - 2. Do not apply resistance to shoulder musculature until cervical spine is stabilized surgically, in a cervical collar, or in a halo.
 - B. Assess for potential complications to P.T. evaluation.
 - 1. Orthostatic hypotension
 - 2. Autonomic dysreflexia may occur in SCI involving T6 and above.
 - a. Symptoms include severe headaches, sweating, red blotchy skin, and behavioral changes.

- b. Symptoms may occur rapidly and are caused by any painful condition (for example, kinked urinary catheter, bowel impaction, severe urinary tract infection, or malposition of extremities).
- c. Treat patient by quickly dropping blood pressure (sit up rapidly), and look for causes.
- d. Autonomic dysreflexia may be a life-threatening situation because a sudden rise in blood pressure may be sufficient to cause a CVA.
- 3. Decubitus. Establish adequate positioning program immediately if skin breakdown is present.
- 4. Deep vein thrombosis. Discontinue passive range of motion if present.
- 5. Hypertrophic ossification
- 6. Psychosocial effects of injury
- C. Avoid overstretching long finger tendons or wrist flexors so tenodesis action is not damaged.
- D. Prevent against postural changes and contractures secondary to muscle tone and muscle imbalance.
- E. Re-evaluate neurological status, strength, and range of motion once weekly; emphasize areas of progress or change.
- F. With clients who are stabilized with a halo vest:
 - 1. Never hold, grab, or pull patient by the uprights.
 - 2. Never lift from the bottom edge of the vest.

Treatment/Goals

- I. Frequency
 - A. See at least one time per day.
 - B. Increase length of treatment session based on patient's tolerance and at your discretion.
- II. Treatment techniques and goals
 - A. Patient on bed rest prior to complete cervical stabilization
 - 1. **Treatment:** Provide active-assistive range of motion and active range of motion exercises to residual muscle groups.

Goal: Strengthen proximal muscle groups.

2. **Treatment:** Provide passive range of motion to nonfunctional upper extremity and lower extremity muscle groups.

Goals: Prevent contractures; increase flexibility.

- B. Patient off bed rest and neck in stabilization support device (soft collar, Philadelphia collar, or halo brace)
 - 1. **Treatment:** Increase endurance in upright position by sitting with vascular support. (Provide with support or abdominal binder if necessary.)

Goals: Improve sitting endurance in wheelchair; improve respiratory function.

2. Treatment: Begin sitting balance activities on edge of mat.

Goals: Establish good sitting balance for transfers, self range of motion, and use of wheelchair.

- 3. Treatment:
 - a. Continue upper extremity strengthening exercises.
 - b. Progress to progressive resistive exercises.
 - c. Begin muscle re-education using electrical stimulation or biofeedback.

Goal: Improve upper extremity strength for transfers, wheelchair propulsion, and weight shift to prevent skin breakdown.

4. **Treatment:** Begin transfer training, rolling, coming to sit from supine, and weight shift in sitting.

Goals: Achieve independent mobility within the limits of the neurological injury; prevent skin breakdown.

5. **Treatment:** Conduct ongoing assessment of equipment needs and recommend or order equipment as needed (if not going to rehabilitation setting).

Goal: Obtain necessary equipment for maximum functional independence.

- 6. Treatment:
 - a. Continue passive range of motion to both lower extremities and instruct patient to perform self range of motion independently once sitting balance is good.
 - b. Instruct family members when possible.

Goal: Maintain range of motion and flexibility in both lower extremities.

7. **Treatment:** Instruct in wheelchair propulsion, operation, and safety; improve propulsion endurance.

Goals: Build endurance for wheelchair propulsion; establish independence in use of wheelchair and its parts.

8. **Treatment:** Instruct patient and family in skin-care and pressure-relief mechanisms.

Goal: Achieve independent skin care.

9. Treatment: Facilitate breathing techniques during exercise and sitting activities.

Goal: Maximize respiratory function.

III. Equipment

- A. Wheelchair. Patient may need projections on hand rims of wheelchair or electric wheelchair with joystick adapted for hand or mouth.
- B. Bath chair
- C. Sliding board. Sliding board may need holes or grooves.
- D. Wheelchair cushion (a necessity)

IV. General considerations

- A. Increase upper extremity strength and endurance for functional abilities.
- B. Encourage weight control because obesity limits mobility.
- C. Follow team management approach to program planning.
- D. Provide counseling on psychosocial aspects and limitations of disability.
- E. Consider referral to state financial aid agencies.

Discharge

- I. Evaluation. Discuss areas of progress, home program needs, follow-up plans, equipment supplied, and suggestions to referring agency on areas requiring further treatment.
- II. Follow-up plan/referral
 - A. Follow up as requested by physician.
 - B. Provide patient with a copy of discharge summary with suggestions on areas that need continued work.
- III. Home program
 - A. Address exercises, range of motion, and endurance concerns.
 - B. Educate patient and family on program.

Patient Example

Patient is a 16-year-old male presenting with C5-6 quadriplegia sustained after falling from the roof of his home. Patient exhibits no functional motor or sensory ability below the level of his lesion. Patient is tolerating upright positioning in his wheelchair for two to three hours at a time and can propel the wheelchair independently for 200 feet. Patient is unable to perform wheelchair weight shifts without minimum to moderate assistance at present.

Goal: (1-2 weeks)

- 1. Patient will assume full flexed position (leaning forward) and full side leaning position to relieve pressure on hips and buttocks using biceps to pull self forward and return to upright using anterior deltoid muscles to push.
- 2. Patient will exhibit this ability with help of wheelchair armrests without assistance from therapist.

Spinal Cord Injury Evaluation

	Hequest	for Consultation and Report		
Patient #				
Name			D.C).В.
Address				
Physician ason for requ	or Service esting consultation—precautio ————	ns and related ractors		
nature (Phys	ician)	Ext #	Beeper	Date
General Imp	pression		۸ ــ -	
	ata		Age _	
Histony	aic	<u> 21</u>		
- natory				
Bange of mo	ation limitations			
nange of me				
Strength (Ma	anual Muscle Test)		BIGHT	
	Upper trapezius	Scapular elevation	Hidiff	
C5	Middle deltoid	Shoulder abduction		
	Biceps	Elbow flexion		<u> </u>
	Pectoralis major (C5-C8)	Horizontal adduction		
C6	Extensor carpi radialus	Radial wrist extension		
C7	Extensor carpi ulnaris	Ulnar wrist extension		
	Flexor carpi radialus	Radial wrist extension		
	Triceps	Elbow extension		
	Extensor digitorum longus	Finger extension		
C8	Flexor caroi ulnaris	Ulnar wrist flexion		
	Flexor digitorum	Finger flexion		
T1	Intrinsics	Finger adduction/abduction		
T1-T10	Abdominals	Trunk flexion		-
11-110				
	Erector spinae	Trunk extension		
L1	Erector spinae Quadratus lumborum	Trunk extension Pelvic elevation		
L1 L2	Erector spinae Quadratus lumborum Iliopsoas	Trunk extension Pelvic elevation Hip flexion		
L1 L2	Erector spinae Quadratus lumborum Iliopsoas Hip adductors	Trunk extension Pelvic elevation Hip flexion Hip adduction		
L1 L2 L3	Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps	Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension		
L1 L2 L3 L4	Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis	Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion		
L1 L2 L3 L4	Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings	Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion Knee flexion		
L1 L2 L3 L4 L5	Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Mediał hamstrings Lateral hamstrings	Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion Knee flexion Knee flexion		
L1 L2 L3 L4 L5	Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings Gluteus medius	Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion Knee flexion Knee flexion Hip abduction		
L1 L2 L3 L4 L5	Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings Gluteus medius Posterior tibialis	Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion Knee flexion Knee flexion Hip abduction Ankle inversion		
L1 L2 L3 L4 L5 S1	Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Mediał hamstrings Lateral hamstrings Gluteus medius Posterior tibialis Gluteus maximus	Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion Knee flexion Knee flexion Hip abduction Ankle inversion Hip extension		
L1 L2 L3 L4 L5 S1	Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings Gluteus medius Posterior tibialis Gluteus maximus Peroneals	Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion Knee flexion Knee flexion Hip abduction Ankle inversion Hip extension Ankle eversion		
L1 L2 L3 L4 L5 S1	Erector spinae Quadratus lumborum Iliopsoas Hip adductors Quadriceps Anterior tibialis Medial hamstrings Lateral hamstrings Gluteus medius Posterior tibialis Gluteus maximus Peroneals Gastroc-soleus	Trunk extension Pelvic elevation Hip flexion Hip adduction Knee extension Ankle dorsiflexion Knee flexion Knee flexion Hip abduction Ankle inversion Hip extension Ankle eversion Plantar flexion		

runctional Ability (Use numerical s	4 – Minimum assistance required 7 – Complete independence
2 Maximal assistance required	4 – Minimum assistance required 7 – Complete Independence
2 - Madarata assistance required	5 – Supervision
5 – Moderate assistance required	o – Modilled Independence
Rolling/bed mobility	Supine to sit
Transfer setup (managem	ient of equipment)
Transfer wheelchair to ma	At Pressure relief
Wheelchair Mobility	
Propulsion forward	Propulsion backward
Turns	
Sitting balance	
Sitting posture	
Neurological Status (See Sensory	Evaluation)
Sensory	
Sharo/dull	Light touch
Proprioception	Kinesthesia
Толе	NIIGƏLIGƏIQ
Rofleves	
NTR	Clonus
Babiaski	
Gan (potential)	
Sit to stand	
	Standing balance
Cardiac/Respiratory Status	Standing balance
Cardiac/Respiratory Status	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Posture	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing	
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment	
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment Short Term Cools (Time Frames)	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames:)	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames:)	
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames:	
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames:)	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames:	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames:	
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames:	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames:	
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	Standing balance
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	
Cardiac/Respiratory Status Skin/Soft Tissue Posture Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan	
Cardiac/Respiratory Status Skin/Soft Tissue Supine Sitting Standing Assessment Short-Term Goals (Time Frames: Long-Term Goals (Time Frames: Plan Signature	

1

Copyright @ 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280



Post Lumbar Laminectomy or Diskectomy Protocol

Objectives

- I. Educate patient in proper body mechanics, posture, and postsurgical precautions to protect the spine from reinjury.
- II. Improve range of motion to normal or functional status.
- III. Return patient to maximum functional ability.

Admission/Evaluation

- I. Areas to evaluate
 - A. General impressions. Include mechanism of injury, occupation, and time post surgery.
 - B. Range of motion. Examine upper and lower extremities for active versus passive motion.
 - C. Strength. Examine upper extremities grossly, perform specific manual muscle tests for lower extremity groups as able (see Precautions during Evaluation and Treatment).
 - D. Neurological. Assess lower extremity sensation and reflexes.
 - E. Skin/soft tissue. Examine surgical incision and lower extremity pressure points (specifically heels).
 - F. Gait. Note need for assistive device, ambulation distance, and any gait deviations present.
 - G. Functional ability. Assess bed mobility; previous functional level of patient should be taken into account to aid in formulating realistic goals.
 - H. Posture. Assess standing posture.
 - I. Cardiac/respiratory. Document resting heart rate, blood pressure, and respirations.
- II. Precautions during evaluation and treatment
 - A. Use caution during bed mobility so that the patient does not perform segmental rolling. Log rolling is the appropriate method.
 - B. Avoid straining stomach and back muscles.
 - C. Avoid sitting for longer than ten minutes at a time during the first two weeks after surgery.
 - D. Avoid excessive forward or backward bending at the waist for the first three to four weeks post operation (for example, tying shoes).
 - E. Lower extremity muscle test may be limited to groups distal to knee. Muscle groups crossing the hip joint may cause patient increased pain if resisted during a muscle test.

Treatment/Goals

- I. Frequency
 - A. See inpatients daily or twice a day for instruction in laminectomy/diskectomy precautions and exercises until independent.
 - B. See outpatients for four to eight weeks as needed to achieve independence in rehabilitation program.
- II. Treatment techniques and goals
 - A. Inpatient program (until patient is independent in activities or until discharge from hospital, usually one to three days)
 - 1. **Treatment:** Instruct patient in laminectomy/diskectomy precautions and log rolling. (See Precautions during Evaluation and Treatment.)

Goal: Protect the spine from further injury.

2. **Treatment:** Initially instruct patient in pelvic tilt, single knee to chest, and straight leg raise. Progress to double knee to chest, lower trunk rotation, and wall slide exercises at the next treatment session.

Goals: Increase strength of trunk flexors; improve mobility of lower back, lower extremities, and pelvis.

- 3. **Treatment:** Restore independence with gait, clear patient on level surfaces and stairs.
- B. Outpatient program (weeks one to three)
 - 1. **Treatment:** Initiate extension exercises. Instruct patient in prone lying, prone on elbows, and prone push-ups. Continue with straight leg raise and lower trunk rotation.

Goals: Increase strength of trunk extensors; improve mobility of lower back, lower extremities, and pelvis.

2. Treatment: Instruct patient in hamstring and hip flexor stretches.

Goal: Increase flexibility of lower extremities.

3. Treatment: Instruct patient in body mechanics and normal posture.

Goal: Prevent additional back injuries.

- C. Outpatient program (weeks four to eight)
 - 1. **Treatment:** Instruct patient in general low back exercise program, including flexion and extension.

Goal: Increase strength and flexibility of trunk and pelvis.

2. **Treatment:** Prescribe walking and, if appropriate, stationary bike programs. **Goal:** Increase general endurance and strength.

- D. Outpatient progression (after week eight, if necessary)
 - Treatment: Prescribe weight training program.
 Goal: Increase strength of all extremities and trunk.
 - 2. **Treatment:** Review body mechanics and normal posture. **Goal:** Prevent additional back injuries.
 - 3. **Treatment:** Advance walking and/or stationary bike program. **Goal:** Maintain and increase endurance and strength.

Discharge

- I. Evaluation
 - A. Patient is discharged when objectives have been achieved.
 - B. Note status at discharge in all areas initially evaluated.
- II. Follow-up plan/referral. Follow up as ordered by physician.
- III. Home program. Give patient written home program of exercises and body mechanics to continue rehabilitation at home.

Patient Example

Patient is a 53-year-old male diagnosed with Herniated Nucleus Pulposus at L4-L5. Patient underwent a lumbar laminectomy for resolution of the problem.

Goals: (4 days post operation)

- 1. Patient will understand positioning precautions and consistently log roll to get out of bed.
- 2. Patient will perform all initial (inpatient) lumbar laminectomy exercises independently.

Spinal Instrumentation Protocol for Scoliosis

(C-Rod, L-Rod, Heinig Procedure, Harrington Distraction Rods)

Objectives

- I. Educate patient in proper body mechanics and precautions to protect the spine from reinjury.
- II. Assist patient to become independent in bed mobility, transfers, and gait activities.
- III. Assist patient to regain preoperative level of function.
- IV. Investigate home situation and coordinate discharge planning with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate
 - A. Preoperative
 - 1. General impression. State diagnosis; assess willingness to cooperate with treatment proposal.
 - 2. Range of motion. Evaluate active versus passive motion of extremities and trunk (see Precautions during Evaluation).
 - 3. Strength. Evaluate muscle strength in extremities and trunk. Perform specific manual muscle tests in the presence of deficits (see Precautions during Evaluation).
 - 4. Functional ability. Note highest independent functional activity, extent of ability in activities of daily living, and areas of difficulty.
 - 5. Neurological. Examine deep tendon reflexes, sensation, and proprioception. Many patients have neurological disorders which caused their scoliosis. Assess each patient as appropriate for diagnosis.
 - 6. Gait. Note any specific deviations, for example, leg length discrepancy or balance abnormalities.
 - 7. Posture. Specifically look for the following deviations in sitting and, if appropriate, standing positions.
 - a. Head: tilted or rotated
 - b. Shoulders: level, protracted, or retracted
 - c. Scapulae: level, winged, abducted, or adducted
 - d. Pelvis: iliac crest level, rotated forward, or backward
 - e. Leg: true/apparent length discrepancy
 - f. Spine: type of curve—C or S, presence of rib hump
 - 8. Cardiorespiratory. Describe respiratory problems secondary to rib deformity, compression of trunk, or neuromuscular disorder.

- B. Postoperative (usually two to three days after surgery)
 - 1. General impressions
 - a. History and diagnosis
 - b. Date and type of surgical procedure
 - c. Level of spinal instrumentation
 - d. Site of bone graft donor site
 - e. Postoperative complications
 - f. Presence of IV, catheter, or chest tube
 - 2. Range of motion. Assess upper and lower extremities. Assess neck, but defer trunk motion.
 - 3. Strength. Evaluate extremities only, with no resistance to hip musculature.
 - 4. Neurological. Evaluate sensation by dermatome levels, deep tendon reflexes, proprioception, abnormal reflexes, clonus, and spinal motor levels.
 - 5. Functional abilities. Note level of independence with bed mobility, log rolling, head control, and upper extremity use. Defer transfers until approved by physician (see General Considerations).
 - 6. Gait. Defer until approved by physician.
 - 7. Skin and soft tissue. Note drainage on bandages and presence of hematomas or edema.
 - 8. Posture. Assess in supine or sitting, if approved by physician, to note deviations.
 - 9. Cardiorespiratory. Note any pre- or postoperative complications. Patient may have chest tube or require frequent respiratory treatments.
- II. Precautions during evaluation
 - A. The degree of spinal stability achieved varies with each patient. Contact the physician performing surgery prior to initiation of treatment to determine stability of fixation.
 - B. Use lower extremities and avoid trunk flexion for transfers (sequence: sidelying, push to sit, sit to stand). Patient should roll away from thoracoplasty when moving to sit.
 - C. Postural hypotension may occur upon sitting and standing. Encourage patient to take deep breaths to relieve dizziness.
 - D. If Harrington rods are fixed to pelvis, perform no hip range of motion above 90° flexion and no rotation.
 - E. Patients with spinal cord injury or spinal fracture (See General Considerations.)
 - 1. Log roll patient only when physician indicates that patient is stable.
 - 2. Avoid manual muscle test of trunk unless approved by physician.
 - 3. Refer to Paraplegia Protocol or Quadriplegia Protocol as appropriate.
 - 4. Joint pain, limitation of motion, swelling, or heat around major weight-bearing joints may indicate heterotrophic ossification or deep vein thrombosis and may require the attention of a physician.

5. Re-evaluate patient weekly to assess the extent of neurological injury or change in status. Frequency of re-evaluation should be reconsidered when patient is out of neurological intensive care unit or off bed rest.

Treatment/Goals

- I. Frequency. Initially see patient more than once a day to increase sitting tolerance. Teach nurse or family member to practice sitting, and instruct caregivers in necessary activities. Once they are confident in assisting patient, decrease frequency of your visits to once a day.
- II. Treatment techniques and goals
 - A. Preoperative treatment
 - 1. **Treatment:** Instruct patient in log rolling, push to sit, and standing using lower extremities.
 - 2. Treatment: Instruct in deep breathing/coughing and ankle pump exercises.
 - 3. Treatment: Discuss progression of activity.

Goals: Prepare patient for postoperative movement using proper body mechanics; decrease pain; protect surgical procedure; prevent postoperative respiratory problems; increase venous circulation.

- B. Postoperative treatment
 - 1. Bed activities
 - a. **Treatment:** One to two days postoperatively, instruct patient in ankle pumps and deep breathing/coughing exercises; begin log rolling side-to-side.
 - b. **Treatment:** Two to three days postoperatively, elevate head of bed to 45°. Progress to patient sitting (using bed controls) to achieve approximately 80°. Instruct patient to perform four times a day for as long as tolerated.
 - c. **Treatment:** Three to four days postoperative, begin log rolling to the side and push to sit with feet dangling from side of bed three to four times a day to tolerance. Assist patient as necessary and instruct responsible family members to assist patient.

Goals: Achieve independent bed mobility; increase venous circulation; increase respiratory function; prevent postoperative complications. Increase sitting tolerance and decrease orthostatic hypotension.

- 2. Transfers
 - a. **Treatment:** Three to four days postoperatively, instruct and have patient perform sit-to-stand transfers using legs to push to stand, avoiding extreme trunk flexion.
 - b. **Treatment:** Four to five days postoperatively, instruct and have patient perform transfer from bed to bedside chair. Patient may sit up in chair to tolerance, gradually increasing number of minutes.

Goals: Establish independent transfers; increase sitting tolerance.

- 3. Gait
 - a. **Treatment:** Four to five days postoperatively, assist patient to ambulate with walker or arm support for short walks and bathroom use. A therapist, family member, or nurse should accompany patient to ensure safety.

- b. **Treatment:** Five to six days postoperatively, ambulate around ward and wean patient from walker. Instruct patient to ambulate to tolerance. Nursing staff or family member should accompany patient if any instability is present.
- c. Treatment: Five to seven days postoperatively, clear patient on stairs.

Goals: Establish independent ambulation on level surfaces and stairs.

- III. Precautions during treatment
 - A. Bony union takes approximately six to nine months, as verified by x-ray. Obtain physician approval before performing activities requiring bony union.
 - 1. Rotation
 - a. Active movements are not harmful before bony union.
 - b. Forced active or passive movements may be harmful before bony union.
 - c. Passive rotation is not harmful after bony union.
 - 2. Spinal extension. Active movement before bony union is harmless.
 - 3. Forward trunk flexion in sitting. This motion is gravity-assisted and is no problem before bony union.
 - 4. Sit-ups. Avoid before bony union occurs in patient with L-Rod fixation to pelvis.
 - 5. Lateral bending. Active movement is harmless before bony union.
 - 6. Hamstring stretch. Limit range of motion to 90° prior to bony union.
 - B. Monitor for orthostatic hypotension.
 - C. Give no resistance to hip or trunk musculature during manual muscle test.
 - D. A patient who is postoperative Heinig procedure or Harrington distraction rods may require bracing or casts prior to sitting.
- IV. Equipment
 - A. Patient may need walker temporarily to allow ambulation.
 - B. If patient has neuromuscular disorder or spinal cord injury, assess need for new equipment or for repairs or modifications to present equipment: wheelchair, gait assistive devices, braces, and the like.
 - C. While in hospital, patient should have an electrically controlled bed if possible.
- V. General considerations
 - A. Patient undergoing L-Rod Instrumentation for neuromuscular disorders, such as spina bifida, cerebral palsy, and muscular dystrophy
 - 1. Patient undergoing two-stage surgery should be seen while in skull traction for range of motion and strengthening exercises only.
 - 2. Discharge when preoperative level of function is reached or arrange for follow-up to achieve/improve preoperative function.
 - B. Patient with vertebral fracture without spinal cord injury undergoing L-Rod Instrumentation for spinal stabilization.
 - 1. Preoperative evaluation. Check with physician for specific precautions regarding patient evaluation and preoperative treatment.
 - 2. Discharge when independent and safe in ambulation.

- C. Patient with vertebral fracture with spinal cord injury undergoing L-Rod Instrumentation for spinal stabilization.
 - 1. Advise physician to order abdominal binder or corset for lower body support to improve respiratory efficiency.
 - 2. Recommend changes in sitting posture for asymmetrical postures.
 - 3. Provide vascular support to lower extremities during standing or sitting activities to avoid hypotension.
 - 4. Always recommend a rehabilitation consult.

Discharge

- I. Evaluation. Evaluate patient progress, noting precautions regarding trunk motion and resistive muscle test to hip flexors, hip extensors, or abdominals.
- II. Follow-up plan/referral. Follow-up by therapist usually is not necessary but may be arranged by physician if problems are present. Assess patients with spinal cord injury or neuromuscular disorders periodically as indicated by primary diagnosis.
- III. Home program
 - A. Review proper body mechanics and reinforce physician's instructions to refrain from vigorous work or exercise until bony union is verified by x-ray (approximately six to nine months).
 - B. Continue to increase walking distance and sitting tolerance at home.
 - C. Provide postural exercises for scapular retraction and shoulder depression, if indicated.
 - D. Encourage bicycling and swimming for endurance activities rather than contact sports, horseback riding, or other potentially traumatic activities. Verify bony union and obtain physician approval prior to recommending vigorous activities or contact sports.

Patient Example

Patient is a 13-year-old female with Marfan's Syndrome. Patient is post surgical L-rod instrumentation for spinal stabilization. Patient needs assistance getting out of bed.

Goals: (1 week)

- 1. Patient will perform supine-to-sit transfers by log rolling with standby assist of 1.
- 2. Patient will be independent with bed exercises and breathing techniques.

Spinal Cord Injury/Rehabilitation Protocol

Objectives

- I. Assist the patient with spinal cord injury to achieve maximum level of functional independence at home and in the community.
- II. Provide education on skin care and wound prevention to patient and family.
- III. Provide education on necessary range of motion and contracture prevention to patient and family.
- IV. Assist with provision of necessary equipment to maximize independence.
- V. Assist with referral to appropriate funding agencies (state Rehabilitation Commission, Chronically Ill and Disabled Children's Services, for example). Refer for outpatient therapy as needed.
- VI. Investigate home situation; assist family and patient with adaptations and provide home program education to patient and family as needed.
- VII. Coordinate discharge planning with other members of rehabilitation team, patient, and family.

Admission/Evaluation

- I. Areas to evaluate (Spinal Cord Injury Evaluation form follows protocol.)
 - A. Range of motion
 - 1. Evaluate active and passive range of motion of all joints.
 - 2. Note presence of rods or internal fixation, attachment to lumbar spine versus pelvis, and any resulting limitation to hip flexion.
 - 3. Evaluate hamstring length with straight leg raise to assess potential for assumption of long sitting.
 - B. Strength. Perform specific manual muscle tests on all available groups. Note presence of rods and their effect (if any) on abdominal and back extensor muscle testing.
 - C. Functional ability
 - 1. Evaluate bed mobility, assumption of long and short sitting, sitting balance (grade static and dynamic balance—see definitions), ability to perform pressure relief, ability with level surface transfers, and potential for sit-to-stand transfer, if indicated (for paraplegic population).
 - 2. Progress to evaluation of ability to perform floor-to-wheelchair and car transfers (see Patient Example).
 - D. Wheelchair skills
 - 1. Initially, evaluate patient's ability to propel wheelchair and operate parts.
 - 2. Progress to assessment of ability to manage ramps, elevators, and doors.

- 3. Progress, if applicable, to assessment of ability to pop wheelies, maneuver wheelchair into and out of car, and manage curbs and steep ramps.
- 4. Assess endurance (distance tolerance) and continue to reassess progress in this area during course of treatment.
- E. Neurological
 - 1. Note presence or absence of deep tendon reflexes and sensation below level of lesion, clonus, and Babinski.
 - 2. Evaluate muscle tone status (noting possible change with position), assess resistance to passive range of motion.
 - 3. Ask patient to describe spasms or cramps, if present.
- F. Skin and soft tissue
 - 1. Check for pressure sores, reddened areas, or blisters.
 - 2. Check for pressure and wrinkle-free fit of shoes and support hose (if worn for prevention of thrombi or emboli).
 - 3. Assess fit of Thoraco-Lumbar Spinal Orthosis (TLSO) or body jacket if applicable, and assure that no pressure areas are developing.
- G. Posture. Assess sitting posture in and out of wheelchair.
- II. Precautions during evaluation
 - A. Limit hip flexion to 90° for patients with rods fixed to pelvis.
 - B. Educate patient that weight shifts must be performed every 15 minutes while sitting in wheelchair.
 - C. Patient with TLSO should not sit up without wearing brace.
 - D. Re-evaluate patient weekly and revise goals as needed.

Treatment/Goals

- I. Frequency. Patient is to be seen twice per day.
- II. Treatment techniques and goals (Time frames are approximate. Averages are indicated for patients without complications.)
 - A. Establish range of motion program.
 - 1. **Treatment:** Perform passive range of motion exercises (stretch) at least once per day. Time frame one to two weeks.

Goal: Achieve full, functional range of motion of all joints with at least 110° of straight leg raise range of motion.

2. **Treatment:** When applicable, instruct patient in self range of motion exercises when patient has grade 4 (good) sitting balance. (See Sitting Balance Definitions following protocol.) Instruct family in passive range of motion for patients unable to perform self range of motion. Time frame four to five weeks.

Goal: Independently prevent contractures at home.

- B. Establish strengthening program. Time frame two to three weeks.
 - 1. **Treatment:** Progress to three sets of 20 repetitions of upper extremity push-ups in parallel bars for patients with adequate upper extremity ability.

2. **Treatment:** Establish progressive resistive exercise program for SCI patients unable to lift their body weight.

Goal: Achieve adequate upper extremity strength for transfers.

3. **Treatment:** Progressive exercise with Rickshaw (exercise equipment for shoulders) until patient tolerates half of body weight per extremity. Modify Rickshaw as needed for patients without elbow stability.

Goal: Establish adequate shoulder depressor strength for functional activities.

- C. Sitting balance. Time frame two to three weeks.
 - Treatment: Progress patient to grade 5 (normal) sitting balance in short sitting.
 Goals: Establish equilibrium reactions; eliminate use of upper extremities for balance.
 - Treatment: Progress patient to grade 5 (normal) sitting balance in long sitting.
 Goals: Establish equilibrium reactions; eliminate use of upper extremities for balance.
- D. Functional activities
 - 1. Time frame one week
 - a. **Treatment:** Instruct patient in supine-to-sit transition.

Goal: Achieve independent supine-to-sit transition.

b. **Treatment:** Establish independent management of lower extremities on and off mat during supine to sit and return.

Goal: Master independent positioning.

c. Treatment: Progress to patient clearing mat with buttocks during push-ups.

Goal: Functional clearance of hips for transfer activities and pressure relief.

- 2. Time frame one to two weeks
 - a. **Treatment:** Progress to scooting side to side in short sitting and in all directions in long sitting with functional clearance of buttocks.

Goal: Establish independent mobility adequate for transfers.

- b. **Treatment:** Progress to transferring from wheelchair to mat and return by using a sliding board with all transfers, then progress to transferring without assistive device, if possible.
- c. Educate family/caregiver to independence with patient transfers if patient is unable to reach independence with this skill.

Goal: Establish independent transfers.

- 3. Time frame three weeks
 - a. **Treatment:** Progress, if able, to transferring to and from bed and toilet. Train family/caregiver, if necessary.

Goal: Establish independent transfers.

b. **Treatment:** Begin training for transfers into and out of car. Educate family/ caregiver, if necessary.

Goal: Establish independent transfers.

c. **Treatment:** If patient exhibits sufficient upper extremity function, begin instruction in transferring to low surfaces. (Stackable mats may be used to vary height of transfer.)

Goals: If applicable, prepare for floor-to-wheelchair transfers; increase upper extremity strength in fully extended position of shoulder.

d. Treatment: Progress to wheelchair-to-floor (and return) transfers.

Goal: Establish independent transfers.

- E. Wheelchair activities
 - 1. Time frame one week

Treatment: Establish independent propulsion for 1,000 feet on level surfaces.

Goal: Achieve independent mobility on rehabilitation unit.

- 2. Time frame two weeks
 - a. **Treatment:** Establish independent propulsion on ramps. Educate patient in use of wheelchair grade aids, if necessary.

Goal: Increase access to community.

b. **Treatment:** Establish independent propulsion on uneven terrain, grass, and the like as able.

Goal: Achieve independent mobility in community.

- 3. Time frame four to five weeks
 - a. **Treatment:** For patients with paraplegia instruct in wheelies, progress to holding a wheelie for one minute, turning 360°, and traveling in a straight line.

Goals: Prepare for access to curbs; increase mobility in narrow spaces and on steep ramps.

b. **Treatment:** Establish independence with transfer of wheelchair into and out of car.

Goal: Prepare for independent community activities.

c. **Treatment:** Instruct in descent of curbs and stationary ascent of two-inch curbs. Progress to ascent of four-inch curbs if patient is able to perform wheelies while in motion.

Goal: Establish independent curb mobility.

4. **Treatment:** By discharge from rehabilitation unit, teach patient how to instruct lay persons in helping patient up or down stairs in wheelchair.

Goal: Exhibit the ability to educate lay people for independent management of architectural barriers.

- F. Gait. Evaluate potential for gait.
 - 1. Patient should present with good pelvic control and active hip flexors, and preferably have unilateral quadriceps strength of fair or better. (Reference: Hussey, R. W., and E. S. Stauffer. 1973. Spinal cord injury requirements for ambulation. Archives of Physical Medicine Rehabilitation 53[Dec.]:544-47).

- 2. Given the expense (financially and metabolically) to patient, it is best if preliminary assessment is performed with training braces, if available. If functional ambulation is questionable, patient motivation and expectations are of primary importance in the decision to progress.
- 3. Refer to orthotist for proper fitting of braces.
- III. Precautions during treatment
 - A. Orthostatic hypotension is usually not a problem with sitting beyond two weeks post injury. Exercise care when performing standing activities.
 - B. Autonomic dysreflexia may occur in SCI involving T6 and above.
 - 1. Symptoms include severe headaches, sweating, red blotchy skin, and behavioral changes.
 - 2. Symptoms may occur rapidly and are caused by any painful condition (for example, kinked urinary catheter, bowel impaction, severe urinary tract infection, or malposition of extremities).
 - 3. Treat patient by quickly dropping blood pressure (sit up rapidly), and look for causes.
 - 4. Autonomic dysreflexia may be a life-threatening situation because a sudden rise in blood pressure may be sufficient to cause a CVA.
 - C. Avoid shearing force on skin during transfers or mobility activities to prevent skin breakdown.
 - D. Avoid flexion of hips greater than 90° if patient has rods attached to pelvis.
- IV. Equipment. Each patient will have individual needs, but most will require a wheelchair and shower chair.
- V. General considerations
 - A. Establish home program addressing self range of motion, active exercise, and positional (skin care) needs.
 - B. Instruct patient in wheelchair maintenance and use of any adaptive equipment; provide patient with telephone numbers for equipment and maintenance needs.
 - C. Review financial status and refer to state vocational rehabilitation agencies and other available funding sources or support groups.

Discharge

- I. Evaluation
 - A. Evaluation at discharge should emphasize specific muscle grades, functional abilities, and neurological findings.
 - B. Assess goal achievement and compare patient status at discharge and admission.
- II. Follow-up plan/referral
 - A. Arrange for delivery of equipment, and assist with provision of loaner equipment if necessary.
 - B. Establish means of communication with patient following discharge.

Patient Example

Patient is a 20-year-old female with T12 paraplegia status post motor vehicle accident. Patient is independent with transfers to level surfaces and is independent with all wheelchair propulsion skills except wheelies. Patient may be progressed to floor-to-wheelchair transfers using the following methods.

Goal: (1-2 days)	Patient will transfer independently from seat of wheelchair forward onto stacked mats at a height of approximately four inches below seat of wheelchair.
Goal: (7-10 days)	Patient will transfer increasing distances as therapist removes one mat thickness (1 inches to $1\frac{1}{2}$ inches) at a time.

Sitting Balance Definitions

Test position:	Patient in short or long sitting.
Normal (5):	Patient maintains sitting test position statically for three minutes; adjusts position when balance is disturbed or during dynamic movements by use of trunk equilibrium reactions without using upper extremities.
Good (4):	Patient maintains sitting test position statically for two minutes, adjusts position when balance is disturbed or during dynamic movements by use of protective reactions using upper extremities.
Fair (3):	Patient maintains test position statically for one minute; unable to adjust position without falling when balance disturbed. Patient can reach for object dynamically only by maintaining balance with opposite extremity, or can reach only forward and backward during dynamic movement.
Poor (2):	Patient unable to maintain test position, maintains sitting balance using hands to prop self. Unable to move in sitting without external support and assistance.
Zero (0):	Flaccid, requires maximal assistance to assume or maintain sitting.
Spinal Cord Injury Evaluation Request for Consultation and Report Patient # Name D.O.B. Address To Physician or Service Reason for requesting consultation-precautions and related ractors Signature (Physician) Beeper Ext # Date S O General Impression Diagnosis Age Admission date ____ History ____ Range of motion limitations Strength (Manual Muscle Test) RIGHT LEFT C4 Upper trapezius Scapular elevation **C**5 Middle deltoid Shoulder abduction Biceps Elbow flexion Pectoralis major (C5-C8) Horizontal adduction C6 Extensor carpi radialus Radial wrist extension **C**7 Extensor carpi ulnaris Ulnar wrist extension Flexor carpi radialus Radial wrist extension Triceps Elbow extension Extensor digitorum longus Finger extension **C**8 Flexor carpi ulnaris Ulnar wrist flexion Flexor digitorum **Finger flexion** T1 Intrinsics Finger adduction/abduction T1-T10 Trunk flexion Abdominals Erector spinae Trunk extension L1 Pelvic elevation Quadratus lumborum L2 lliopsoas Hip flexion Hip adductors Hip adduction L3 Quadriceps Knee extension L4 Ankle dorsiflexion Anterior tibialis Medial hamstrings Knee flexion L5 Lateral hamstrings Knee flexion Gluteus medius Hip abduction Posterior tibialis Ankle inversion **S1** Gluteus maximus Hip extension Peroneals Ankle eversion Gastroc-soleus Plantar flexion **S2** Toe flexors Toe flexion

Copyright @ 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280

1 – Total assistance required	4 – Minimum assistance required 7 – Complete independence
2 – Maximal assistance required	5 – Supervision
3 – Moderate assistance required	6 – Modified independence
Rolling/bed mobility	Supine to sit
Transfer setup (manageme	ent of equipment)
Transfer wheelchair to ma	t Pressure relief
Wheelchair Mobility	
Propulsion forward	Propulsion backward
Turns	
Sitting balance	
Sitting posture	
Neurological Status (See Sensory	Evaluation)
Sensory	
Sharp/dull	Light touch
Proprioception	Kinesthesia
Tone	
Beflexes	
DTB	Clonus
 Babinski	
Gait (potential)	
Sit to stand	Standing balance
Cordice/Respiratory Status	
Posture	
Supine	
Sitting	
Standing	
Assessment	
Short-Term Goals (Time Frames:)
Long-Term Goals (Time Frames:)
	······································
Plan	
Signature	
	<u>_</u>
Date Service	· · · · · · · · · · · · · · · · · · ·



Copyright @ 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280

Orthopedics

Key to Exercises given in Orthopedic Protocols

Phase I Patient should progress to 6 to 8 sets of 10 repetitions of the following exercises:

Isometrics Quadriceps sets Hamstring sets Gluteal sets Adductor sets

Dynamic Exercise Straight leg raise Short arc quad Hip abduction Hamstring curls Hip and knee flexion Dorsiflexion/Plantarflexion

Phase II Exercise with weights. Start with 1 to 2 pounds, add 1 to 2 pounds per week as tolerated.

Place weight on ankle. Patient should progress to 8 sets of 10 repetitions of the following exercises: Straight leg raise Short arc quad Hamstring curls

Place weight above knee. Patient should progress to 8 sets of 10 repetitions of: Hip abduction in sidelying

Phase III Isokinetic exercise.

This page left intentionally blank.

	Gait Training Eva	luation	
Patient #	-		
Name			
Name		D.O.B	
Address			
			9 - y
tient Profile/Diagnosis			CMalapoort
mission date Surgery	date Procedures	performed	<u></u>
Cast/splints			
Long leg cast	Short leg cast	Patellar tendon-bearing ca	st
Posterior splint	Cylinder cast	Knee immobilizer	
Other			and the second second
Comments			1. A. A. A.
Subjective Comments			
Objective Information			
	within functional limits		
Limitations			
Strength			
Within normal limits	Within functional limits		
Limitations			
Exercises taught			
Transfers			
	Standby assist		
Minimal assist	☐ Moderate assist		
Maximal assist			
Comments			
Gait			
1. Assistive device	_		
L Crutches	Walker	└ Cane	∐ N/A
Comments			
2. Weight-bearing status	_		
Non-weight bearing	Touch-down weight bear	ng	
Partial weight bearing	Weight bearing as tolerate	ed	
Comments			
3. Level surfaces			
	Standby assist	Minimal assist	
Moderate assist	Maximal assist		
4. Stairs			
Independent	Standby assist	Minimal assist	
Moderate assist	Maximal assist	□ N/A	
5. Endurance			
Poor	🗆 Fair	Good	
Distance ambulated			
Neurological Status			
Within normal limits	Deficit		
1. Describe deficit			
2. Balance			
Good	Fair	Poor	

Copyright © 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280

A Assessment		
Short-Term Goals		
1. Independent gait		
Level surfaces	□ Stairs	
If limitations, comment		
2. Independent performa	nce of home exercise program	
If limitations, comments _		
3. Other		
Long-Term Goals		
1. Maximal functional ab	lity	
2. Other		
P Plan		
Discharge from P.T.	Continue outpatient P.T.	
Clinic follow-up	Written home program	
Other		

Signature _____

Date ______ Service ______

Copyright © 1991 by Therapy Skill Builders, a division of The Psychological Corporation / All rights reserved / 1-800-228-0752 / ISBN 07616681280

Ankle Fracture Protocol

Objectives

- I. Achieve functional range of motion.
- II. Achieve functional strength.
- III. Establish independent gait.
- IV. Return patient to previous functional activities.

Admission/Evaluation

- I. Areas to evaluate
 - A. Postoperative inpatient
 - 1. Range of motion
 - a. Involved ankle is usually in short leg cast.
 - b. Specifically assess knee and hip range of motion of involved lower extremity and gross range of motion of other extremities.
 - 2. Muscle strength. Grossly assess strength of all extremities.
 - 3. Neurological. Assess sensation of area distal to cast on involved extremity.
 - 4. Functional ability. Assess ability to transfer from a sitting to a standing position.
 - 5. Gait. Evaluate use of assistive device, distance ambulated, and amount of assistance required. (Patient is usually non-weight bearing.)
 - 6. Cardiorespiratory. Evaluate pre-existing conditions; note heart rate and blood pressure response during gait.
 - B. Outpatient
 - 1. Range of motion
 - a. Same as above until cast has been removed at six to eight weeks, when fracture has healed.
 - b. Measure specific ankle and toe motion when cast is removed.
 - 2. Muscle strength
 - a. Same as above until cast has been removed.
 - b. Measure specific ankle and toe strength when cast has been removed and adequate healing has occurred.
 - 3. Neurological. Assess involved foot and ankle when cast is removed.
 - 4. Functional ability. Assess transfers in home and community.
 - 5. Gait. Assess weight-bearing status and assistive device requirements as patient progresses from non-weight bearing to independent.
- II. Precautions during treatment: None

Treatment/Goals

- I. Frequency
 - A. Inpatients should be seen one or two times a day until goals are achieved.
 - B. Outpatients are scheduled one to three times per week until independent with home program.
- II. Treatment techniques and goals
 - A. Postoperative inpatient
 - 1. **Treatment:** Prescribe lower extremity Phase I active exercise program and isometrics for gastrocnemius-soleus, anterior tibialis, invertors, and evertors.

Goal: Independence with home exercise program.

2. **Treatment:** Train patient to independence with non-weight-bearing gait on all surfaces.

Goal: Establish independent non-weight-bearing gait.

B. Outpatient (three to four weeks postoperative)

Treatment: When short leg walking cast is applied, progress to partial weightbearing gait and begin weaning from assistive devices.

Goal: Establish independent partial weight-bearing gait.

- C. Outpatient (six to eight weeks postoperative, cast removed)
 - 1. **Treatment:** Perform range of motion, strengthening, and stretching of ankle, including heel cord stretch.

Goal: Increase range of motion and strength of ankle.

2. **Treatment:** Begin weight bearing as tolerated gait and progress to using one crutch. Remove crutch when gait is pain-free and patient is without limp.

Goal: Establish independent gait without assistive device.

3. **Treatment:** Provide external ankle support and elevation (elastic support bandage or air splint).

Goal: Control edema.

4. **Treatment:** Begin walking or jogging program and sports activities when range is adequate and gait is pain-free.

Goal: Return to previous functional activity level.

III. Precaution during treatment. When reduction is accomplished with syndesmosis screw, it must be removed prior to weight bearing.

Discharge

- I. Evaluation. Discharge patient from physical therapy once objectives have been met.
- II. Follow-up plan/referral. Follow up as ordered by physician.
- III. Home program. Provide written exercise/activity program, including heel cord stretch.

Patient Example

Patient is a 20-year-old male eight weeks status post left ankle fracture with short leg cast removed today. Patient fitted with air cast and is independent on crutches with 50% to 75% weight bearing. Active range of motion left ankle: dorsiflexion 0° , plantarflexion 25° , inversion 5° , eversion 0° .

Goals: (2 weeks)

- 1. Patient will increase range of motion in left ankle to dorsiflexion 10°, plantarflexion 40°, inversion 10°, eversion 5°.
- 2. Patient will start on progressive strengthening exercises.
- 3. Patient will bear weight as tolerated, progressing from two crutches to one crutch.

This page left intentionally blank.

Ankle Sprain Protocol

Objectives

- I. Achieve normal range of motion.
- II. Eliminate swelling.
- III. Achieve normal strength of ankle musculature.
- IV. Return to functional activities as healing of ligamentous structures and return of range of motion occurs.

Admission/Evaluation

- I. Areas to evaluate
 - A. Range of motion. Assess both ankles.
 - B. Soft tissue. Evaluate location and degree of swelling, areas of point tenderness, and so on.
 - C. Evaluate functional ability.
 - D. Evaluate muscle strength.
 - E. Evaluate gait, note need for physical assistance and/or assistive devices.
- II. Precautions during evaluation: None

Treatment/Goals

- I. Frequency
 - A. Follow acute patients daily for ice, whirlpool, exercise, and taping.
 - B. As swelling decreases and range of motion returns, place patient on home program of ice and exercise.
- II. Treatment techniques and goals
 - A. Primary sprain or single ligament sprain
 - 1. Acute stage
 - a. Treatment:
 - i. Use ice whirlpool, contrast bath, or ice packs to control swelling.
 - ii. Follow with active range of motion exercises.
 - iii. Tape ankle in neutral position.

Goals: Decrease swelling; increase range of motion.

b. **Treatment:** Begin touch-down weight-bearing crutch training, progressing to weight bearing as discomfort decreases.

Goals: Decrease swelling; increase range of motion and functional ability.

- 2. Subacute stage
 - a. Treatment: Decrease edema with ice packs or contrast bath.

Goal: Control swelling.

b. Treatment: Bind with elastic or support bandage.

Goal: Control swelling.

c. **Treatment:** Continue range of motion exercises, progressing to heel cord stretching and toe raises.

Goal: Increase range of motion and strength of ankle musculature.

d. **Treatment:** Progress off crutches as soon as gait is pain-free and range of motion is full.

Goal: Return to previous level of function.

- B. Second-degree and third-degree sprains or involvement of more than one ligament.
 - 1. **Treatment:** Treat with cast or ankle orthosis if moderate swelling and/or instability are present. If ankle is not casted, follow progression under A.
 - 2. **Treatment:** When cast or orthosis is removed (three to six weeks), begin range of motion exercises, heel cord stretching, and toe raises.

Goal: Restore range of motion and strength of ankle musculature.

3. **Treatment:** Control swelling with elastic support bandage and elevation.

Goal: Control swelling.

4. **Treatment:** Fit with ankle/foot orthosis, such as air splint, if instability persists after rehabilitation.

Goal: Return to previous level of function.

- III. Precautions during treatment
 - A. Return to functional activities (jogging and recreational sports) only when range of motion is equal to uninvolved ankle, no swelling is present, and gait is pain-free.
 - B. Use of heat on ankle is contraindicated if swelling is present. Use ice and contrast baths to decrease swelling.
- IV. General considerations
 - A. Primary or single ligament: time frame is approximately two weeks.
 - B. Second-degree or two ligaments: time frame is approximately eight to ten weeks.

Discharge

- I. Evaluation. Discharge patient from physical therapy once objectives have been met.
- II. Home program. Place patient on home program of active exercise and heel cord stretching.

Patient Example

Patient is a 26-year-old male with left grade 1° ankle sprain. Patient presents with decreased range of motion, decreased strength and edema.

- **Goals:** (1 week) Decrease swelling to within normal limits.
 - (2 weeks) Increase ankle range of motion to within normal limits.
 - (3 weeks) Increase ankle strength to within functional limits.

This page left intentionally blank.

Anterior Cruciate Ligament Repair or Reconstruction Protocol

Objectives

- I. Increase strength, power, and endurance of involved musculature to at least 90% of uninvolved extremity.
- II. Return to normal range of motion.
- III. Return to functional activities as healing of repair and return of strength and range of motion dictate.

Admission/Evaluation

- I. Areas to evaluate
 - A. Inpatient evaluation
 - 1. Assess gross range of motion of uninvolved extremities (involved extremity will be in long leg cast immediately postoperative).
 - 2. Assess gross muscle strength of uninvolved extremities and quadriceps control and ability to do straight leg raises on involved extremity.
 - 3. Assess preoperative functional ability.
 - B. Outpatient evaluation
 - 1. Test range of motion of involved knee.
 - 2. Assess muscle strength of involved knee.
 - a. Strength is tested initially by gross muscle testing and ability to do straight leg raises.
 - b. Strength, power, and endurance are evaluated with isokinetic exercise equipment per physician request.
 - 3. Evaluate functional ability.
 - 4. Evaluate cardiac and respiratory status, if indicated.
- II. Precautions during evaluation
 - A. Avoid last 30° of terminal extension out of brace (short arc quadriceps).
 - B. Apply resistance at tibial tubercle for Phase II exercises, and over distal femur for hip abduction/adduction.

Treatment/Goals

- I. Frequency
 - A. See inpatients daily for crutch training and Phase I exercises.
 - B. Provide follow-up outpatient physical therapy as determined by follow-up visits to physician. Adjust frequency of patient's visits if specific problems exist that cannot be eliminated with home program.
- II. Treatment techniques and goals
 - A. Inpatient program, patient in long leg cast or universal brace.
 - 1. **Treatment:** Instruct in Phase I exercises: submaximal quadriceps sets, hamstring sets, abductor sets, adductor sets, gluteal sets, ankle pumps, and straight leg raise.

Goals: Perform Phase I exercises independently; increase strength.

2. Treatment: Establish touch-down weight-bearing gait with lateral supports.

Goals: Facilitate independent gait on level surfaces and stairs with lateral support; increase strength and independent leg control.

- B. First dressing change to three weeks
 - 1. **Treatment:** Emphasize full knee extension, quadriceps sets, straight leg raise in full extension; use electrical stimulation if necessary. Begin prone extension with knee over end of table or extension box with weight over knee if necessary. Hamstring flexibility and patellar mobilization can be addressed as well.

Goal: Prevent damage to ligament repair.

2. Treatment: Continue Phase I exercises.

Goal: Increase strength.

3. Treatment: Begin gravity-assisted and active-assisted knee flexion.

Goal: Increase range of motion.

4. Treatment: Continue touch-down weight-bearing gait with crutches.

Goal: Establish independent gait on level surfaces and stairs.

- C. Outpatient program (three to six weeks postoperative)
 - 1. **Treatment:** Begin weight bearing as tolerated, four-point crutch gait. Begin closed chain activities (squats).

Goal: Strengthen knee musculature in positions which protect ligament repair.

2. **Treatment:** Begin patellar mobilization and passive range of motion out of brace (extension in prone and active and passive flexion in sitting). Use exercise band for resistance as needed.

Goal: Increase patellar mobility.

3. **Treatment:** Progress to Phase II exercises when quadriceps control is adequate (no extension lag with straight leg raises), and there is minimal pain and joint effusion. Increase resistance approximately one time per week.

Goals: Become independent with Phase II exercises; increase strength.

4. Treatment:

- a. Progress to swimming.
- b. Begin exercise bike as soon as range is adequate (90° flexion).

Goal: Increase endurance and range of motion.

D. Outpatient program (6 to 12 weeks)

1. Treatment:

- a. Continue work on strengthening.
- b. Perform KT 1000 (knee arthrometer) evaluation at six weeks. Progress to isokinetic exercise equipment or gym equipment when strength is adequate (for males—approximately ten pounds with exercises, for females eight pounds). High speed only: 240° and 180° per second.

Goal: Increase strength and endurance.

2. Treatment:

a. Progress patient off crutches when strength and range of motion are adequate (-10° to 90° range) and patient has no limp.

Goal: Establish independent gait without lateral support or limp.

- 3. Treatment:
 - a. Continue work on range of motion and mobilization.
 - b. Progress to stretching, if indicated.
 - c. Progress to closed kinetic chain exercises.

Goal: Increase strength, endurance, and flexibility.

4. Treatment: Progress to standard bike once patient is off crutches.

Goal: Increase strength, endurance, and range of motion.

5. **Treatment:** Begin activities to increase knee joint proprioception (BAPS Board, cross country ski machine).

Goal: Increase knee function.

E. Outpatient program (3 to 6 months)

1. **Treatment:** Continue strengthening and range of motion exercises (add 60°/second isokinetics). Evaluate with KT 1000 at three months.

Goal: Increase strength and range of motion.

2. **Treatment:** Continue bicycling and swimming. Begin "straight ahead" activities (water aerobics, jogging, walking, and bicycling).

 $\label{eq:Goal:Increase} \textbf{Goal: Increase strength and endurance.}$

3. **Treatment:** Initiate agility drills and jumping rope. Continue with proprioception trials, add work with Heiden board, for example.

Goal: Increase coordination and agility.

- F. Outpatient program (6 months)
 - 1. **Treatment:** Continue work on strengthening, range of motion, biking, and swimming.

Goal: Increase range of motion, strength, and endurance.

2. Treatment: Progress to functional activities.

Goal: Return to previous functional level.

3. **Treatment:** Evaluate with high-speed isokinetics at six months, then once monthly.

Goal: Assess return to previous functional level.

4. **Treatment:** Gradually progress to noncompetitive and competitive sports once strength, power, endurance, and healing of involved limb are adequate.

Goal: Return to previous functional level.

G. Special cases

- 1. Treatment: Tibial bone avulsion
 - a. Treated with open reduction internal fixation cast, which is usually removed at six weeks.
 - b. Do not perform extension with resistance through last 30° until three months postoperative.
 - c. After three months, there are no restrictions in rehabilitation program.
- 2. Treatment: Extra-articular repairs
 - a. Patient is usually placed in a locked brace or cast for five weeks working on Phase I and II exercises.
 - b. Brace is usually unlocked or removed at five weeks; continue with Phase II exercises
 - c. Begin progressive weight bearing. Begin biking and swimming as described previously.
- III. Precautions during treatment
 - A. Return to functional activities (biking, swimming, jogging, recreational sports) only when adequate strength, power, endurance, and healing are present.
 - B. Resistance should be placed on tibial tubercle for straight leg raise; over femur for adduction and abduction of hip.

IV. Equipment

- A. Two- to ten-pound cuff weights
- B. Bicycle ergometer
- C. Isokinetic equipment
- D. KT 1000 Arthrometer
- E. Electrical stimulator
- F. Heiden board

Discharge

- I. Evaluation
 - A. Patient is discharged from physical therapy once objectives have been met.
 - B. Follow-up is usually not required.
- II. Home program. Patient should be placed on maintenance home exercise program emphasizing quadriceps and hamstrings.

Patient Example

Patient is a 21-year-old male presenting three weeks post right anterior cruciate ligament repair. Patient is presently in a hinged brace set at 30° to 90° of flexion. Active range of motion in right knee with brace is 30° to 60° . Patient is independent on crutches with non-weight-bearing gait.

Goals: (2 to 3 weeks)

- 1. Patient will increase active knee flexion range of motion to 30° to 90° within limits of hinged brace.
- 2. Patient will perform Phase I exercises (six to eight sets of ten repetitions) with minimal to no extension lag.

This page left intentionally blank.

Anterior Shoulder Dislocation Protocol

Objectives

- I. Increase strength, power, and endurance of involved musculature to at least 90% of uninvolved extremity.
- II. Restore normal range of motion.
- III. Return to manual labor and/or recreational sports involving upper extremities once range of motion and healing are adequate and normal muscle strength is present.

Admission/Evaluation

- I. Areas to evaluate
 - A. Measure active range of motion of involved shoulder, elbow, forearm, wrist, and hand.
 - B. Muscle strength. Assess strength with isometrics and by ability to do active exercise.
- II. Precautions during evaluation. During acute phase of treatment, avoid shoulder external rotation, extension, and abduction.

Treatment/Goals

- I. Frequency
 - A. See patient after each visit to physician to progress home rehabilitation program.
 - B. Follow patient longer if specific problems exist which cannot be eliminated by a home program.
- II. Treatment techniques and goals
 - A. Treatment: Acute phase. Place in shoulder immobilizer after reduction.

Goal: Decrease pain.

- B. Treatment: Two weeks post dislocation
 - 1. Place in regular sling.
 - 2. Begin isometric, active-assistive, and active exercise program, avoiding abduction and external rotation.
 - 3. Begin isotonic program using surgical tubing or free weights, emphasizing adductors and internal rotators with arm at side.

Goals: Increase range of motion and muscle strength.

- C. Treatment: Four to five weeks post dislocation
 - 1. Patient should wear sling during the day for comfort.
 - 2. Progress to noncompetitive, noncontact sports.
 - 3. Continue exercising with surgical tubing.

Goal: Increase range of motion and muscle strength.

D. **Treatment:** Return to manual labor and recreational sports involving upper extremities once range of motion is full and strength, power, and endurance are approximately 90% of preinjury level (tested by isokinetic exercise equipment) or muscle strength test is normal in all major groups (indicated by specific muscle test).

Goals: Modify home program for specific deficits; determine patient's ability to return to preinjury activity level.

- III. Precautions during treatment
 - A. Avoid external rotation and extremes of abduction for four to six weeks.
 - B. If limited glenohumeral motion is present, exercise in supine to help control abnormal scapulo-thoracic motion.
 - C. Work on external and internal rotation (resistive and isokinetics) with arm at side.
- IV. Equipment
 - A. Surgical tubing
 - B. Isokinetic equipment

Discharge

- I. Evaluation. Discharge patient from physical therapy once objectives have been met.
- II. Follow-up plan/referral. Place patient on home maintenance program of isotonic exercises to maintain strength and flexibility.

Patient Example

This 25-year-old male presents to physical therapy two weeks following anterior shoulder dislocation. Patient has been treated using shoulder immobilizer up to this point.

Goal: (1 week) Patient will perform 30 repetitions three times a day of isometric exercises emphasizing horizontal adduction and internal rotation.

Arthroscopic Meniscectomy Protocol

Objectives

- I. Increase strength, power, and endurance of involved musculature to at least 90% of uninvolved extremity.
- II. Achieve normal range of motion.
- III. Return to functional activities as strength and range of motion dictate.

Admission/Evaluation

- I. Areas to evaluate
 - A. Inpatient evaluation (Gait Training form can be used.)
 - 1. Range of motion
 - a. Evaluate gross range of motion of uninvolved extremities.
 - b. Evaluate hip and ankle of involved extremity. (Involved knee is usually immobilized immediately postoperatively.)
 - 2. Muscle strength
 - a. Evaluate gross motor strength of uninvolved extremities.
 - b. Grossly evaluate hip and ankle musculature of involved extremity.
 - c. Evaluate musculature around knee by ability to do straight leg raise and hamstring sets.
 - 3. Evaluate functional ability with sit-to-stand transfers.
 - 4. Gait. Note ability with crutches, need for assistance, and so on.
 - B. Outpatient evaluation
 - 1. Range of motion. Evaluate range of motion of involved knee.
 - 2. Muscle strength
 - a. Initially, evaluate muscle strength of involved musculature by ability to do straight leg raise and gross muscle testing.
 - b. Once range of motion is pain-free, evaluate muscle strength isokinetically.
 - 3. Evaluate functional ability.
 - 4. Evaluate cardiac and respiratory status.
 - 5. Evaluate gait.
- II. Precaution during evaluation. Take precautions for associated pathology as appropriate.

Treatment/Goals

- I. Frequency
 - A. See inpatients for instruction in Phase I exercises and crutch training as necessary.
 - B. Follow progress of outpatients and change program as indicated.
 - C. Follow patient on a more regular basis if specific problems exist that cannot be eliminated with a home program.
- II. Treatment techniques and goals
 - A. Inpatient program
 - 1. Treatment: Instruct patient in Phase I exercises.

Goal: Increase muscle strength.

2. **Treatment:** Begin weight bearing as tolerated. Gait train with crutches as necessary.

Goal: Facilitate independent ambulation.

- B. Outpatient program
 - 1. Treatment: Initiate gravity-assisted flexion two days postoperative.
 - 2. Treatment: Continue work on strengthening.
 - a. Progress to Phase II exercises when control and endurance are adequate. (Patient can do 60 to 80 straight leg raises without lag.)
 - b. Progress to isokinetic exercise equipment or gym equipment when strength is adequate (for males: ten pounds with exercises; for females: eight pounds).

3. Treatment:

- a. Progress to full weight bearing as tolerated with crutches or cane.
- b. Progress off crutches or cane when range of motion reaches -10° to 90° and strength is adequate.
- 4. Treatment: Initiate swimming and biking program.
- 5. **Treatment:** Progress to walking or jogging program when strength and power reach 80% of uninvolved limb (measured isokinetically).
- 6. **Treatment:** Progress to cutting activities and sports when strength and power reach 90% of uninvolved limb (measured isokinetically).

Goals: Increase strength of musculature, especially quadriceps, to 90% or greater of uninvolved limb; achieve normal range of motion; return to previous level of function.

III. Precautions during treatment

- A. Do not perform range of motion on knee until two days postoperative.
- B. Return to functional activities (biking, swimming, jogging, and recreational sports) only when adequate strength, power, endurance, and range of motion are present.
- IV. General consideration. Time frame is approximately two to six weeks.

Discharge

- I. Evaluation. Discharge patient from physical therapy when goals have been met.
- II. Home program. Place patient on maintenance program of home exercises.

Patient Example

Patient is a 35-year-old female two weeks status post left meniscectomy who ambulates with a minimal limp. Left knee active range of motion is 0° to 100°. Patient is currently doing Phase I exercises (six to eight sets of ten repetitions) without extension lag.

Goals: (2 to 3 weeks)

- 1. Patient will be able to perform Phase II exercises (six to eight sets of ten repetitions with six- to eight-pound weights) with no extension lag.
- 2. Patient will walk with normal gait.

This page left intentionally blank.

Cervical or Lumbar Injury Protocol

Objectives

- I. Educate the patient in proper body mechanics, posture, and precautions to protect the spine from injury.
- II. Return range of motion to functional level.
- III. Return to maximum functional ability.

Admission/Evaluation

- I. Areas to evaluate. (Cervical/Lumbar Evaluation form follows protocol.)
 - A. General impressions
 - 1. Diagnosis
 - 2. Mechanism of injury
 - 3. Nature of pain
 - 4. Occupation
 - B. Range of motion. Examine trunk/neck and extremities.
 - C. Strength. Examine trunk/neck and extremities.
 - D. Neurological. Assess sensation and reflexes.
 - E. Soft tissue/palpation. Assess muscle tone and areas of tenderness.
 - F. Gait. Note any deviations.
 - G. Special tests. Perform special tests per evaluation form.
- II. Precautions during evaluation
 - A. Pain may limit range of motion and strength testing.
 - B. The inpatient evaluation may take several days to complete due to acute condition of patient.

Treatment/Goals

- I. Frequency
 - A. Inpatient. Twice a day until goals are met.
 - B. Outpatient. Two to five weeks until goals are met.
- II. Treatment techniques and goals
 - A. **Treatment:** Instruct patient in written home program of stretching and strengthening exercises.

Goals: Increase strength, range of motion, and flexibility; decrease pain.

B. Treatment: Educate patient in proper body mechanics.

Goal: Demonstrate proper lifting techniques and posture.

C. Treatment: Apply modality of choice to affected soft tissue.

Goals: Decrease muscle spasm to within normal limits; control pain.

- III. Precaution during treatment. Heat should not be used for 72 hours following steroid injections.
- IV. Equipment
 - A. Electrical stimulator
 - B. TENS
 - C. Ultrasound
 - D. Ice cup
 - E. Hot packs
 - F. Lumbosacral support

Discharge

- I. Evaluation
 - A. Specifically evaluate all areas identified as problems in the initial evaluation.
 - B. Evaluate patient's ability to comply with a home program.
- II. Follow-up plan/referral
 - A. Can follow outpatients for up to one year if needed.
 - B. An inpatient will require a new consult should outpatient therapy be required.
- III. Home program. The program should include written material on the exercises prescribed.

Patient Example

Patient is a 51-year-old female who was recently involved in a motor vehicle accident. Patient presents with decreased cervical active range of motion and increased tenderness and muscle tone over cervical and upper trapezius region. Patient reported a pain level of 7 on a scale of 1 to 10.

Goal: (2 weeks) Patient will report a decrease in pain to level 4 on a scale of 1 to 10.

Patient Example

96

Patient is a 38-year-old male with mechanical low back pain secondary to a lifting injury at work. Patient exhibits poor posture and a lack of understanding of proper body mechanics.

Goal: (1 week)

Patient will consistently exhibit proper posture and functional body mechanics.

Cervical/Lumbar Eval	luation
----------------------	---------

Patient #	
Name	D.O.B.
Address	
Be Completed by Patient To help us assess the cause of your problem, we ask you to complete this form physical therapist. Please answer as completely as possible.	before being seen by a
rsonal Data	
 Are you currently working? yes no If yes, please give your occupation and describe physical demands. 	4-5.
I. What is your main complaint or problem?	
2. It is important that we have a measure of your pain. Please rate the level of your pain on a scale of 1 to 10. 1 2 3 4 5 6 7 8 9 10 Mild Moderate Extreme discomfort pain agony 0 0	
 4. Which of these words describe your pain? (Check all that apply.) Sharp Dull Burning Aching Tingling Numb Constant Variable Radiating (moves) 	A A A
5. Are there any positions or activities that make your pain worse?	
6. Are there any positions or activities that lessen your pain?	
story 1. How did your problem start?	
2. Please list any medications you are taking for this problem.	
3. What tests or treatment have you had for this problem?	

Primary diagnosis			
Secondary diagnosis			
Posture			
Standing			
Range of Motion (P = Pain) (N	ote ROM)		
Elexion	Extension	Comments	
	B side glide		
	B rotation		
L side bend	R side bend		
Active movement	FB		
Key: Restricted			
Blocked	SBL SBH		
Pain/restr.			
Hypermobile M			
Muscle Test Neck	ВВ		
Cervical flexion	Cervical L rotation	Cervical L side ben	d
Cervical extension	Cervical R rotation	Cervical R side ben	d
Upper Extremities			
C5 deltoidR	L C7 trice	psR	L
C6 wrist extensors R	L C8 finge	er flexors R	L
Trunk			
Trunk flexion	Trunk extension		
Lower Extremities			
L 1, 2 psoas R	L L5 exte	ensor hallicus longus	RL
L 3 quad R	L S1 perc	onealsR	L
L 4 anterior tibialis R	L		
Neurological			
Sensation			
Reflexes			
Soft Tissue/Palpation			
Special Tests			
Rx Given			
Assessment			ALLE T
Goals			
Short-Term Goals (Less than 3 w	eeks)		
	1		
	·		
			·
	deily living		
	uany inving		
Duration	Freque	ncy	
Cianatura			-
Date Serv	ICE		

Extensor Malalignment Protocol

Objectives

- I. Increase muscle strength of quadriceps, especially vastus medialis obliquus.
- II. Increase flexibility of hamstrings and gastrocnemius-soleus.
- III. Return to functional activities as symptoms decrease and quadriceps strength improves.

Admission/Evaluation

- I. Areas to evaluate
 - A. Range of motion. Assess knee specifically, all other areas grossly.
 - B. Muscle strength. Test by ability to do straight leg raise and by gross muscle testing.
 - C. Flexibility. Assess hamstrings and gastrocnemius-soleus length.
- II. Precautions during evaluation: None

Treatment/Goals

- I. Frequency
 - A. See patient initially and place on home program.
 - B. Follow patient on weekly or biweekly basis to monitor program.
- II. Treatment techniques and goals-Outpatient
 - A. **Treatment:** Instruct patient in Phase I exercises, emphasizing vastus medialis obliquus strengthening.
 - B. **Treatment:** Progress to Phase II when control and endurance are adequate (60 to 80 straight leg raises without lag).
 - C. **Treatment:** Progress to isokinetic exercise equipment and gym equipment if long arc quadriceps are pain-free and patient can lift eight to ten pounds in Phase II exercises.
 - D. **Treatment:** Initiate swimming and biking. Patient should bike with minimal knee flexion initially.
 - E. **Treatment:** Gradually progress to running and sports when range and functional activities are pain-free and adequate strength is present. (Patient completes Phase II exercises using six to eight pounds.)

Goals: Increase strength of quadriceps, especially vastus medialis obliquus; increase flexibility of hamstrings and gastrocnemius-soleus; return to previous level of function.

III. Precaution for treatment. Avoid short and long arc quads if extension is painful.

Discharge

- I. Evaluation. Discharge patient once objectives have been met.
- II. Home program. Place patient on maintenance home program emphasizing quadriceps strengthening.

Patient Example

Patient is an 18-year-old female who has complained of right knee pain for two months. Patient was diagnosed with right extensor malalignment syndrome. Patient was noted to have tight hamstrings (60° straight leg raise) and heel cord (to 90° dorsiflexion) with poor muscle development of vastus medialis oblique (VMO).

Goals: (2 weeks)

- 1. Patient will become independent with Phase I exercises (six to eight sets of ten repetitions) with emphasis on VMO strengthening.
- 2. Patient will progress to Phase II after two weeks if there is no extensor lag.
- 3. Patient will achieve 80° straight leg raise and 80° dorsiflexion.

Extensor Realignment Protocol

Objectives

- I. Increase muscle strength of quadriceps, specifically vastus medialis obliquus.
- II. Increase lower extremity flexibility, specifically hamstrings and gastrocnemius-soleus.
- III. Achieve independent gait.
- IV. Return to functional activities.

Admission/Evaluation

- I. Areas to evaluate
 - A. Postoperative inpatient
 - 1. Range of motion. Involved extremity will usually be in knee immobilizer at 0° extension. Assess hip/ankle of involved limb specifically and all other extremities grossly.
 - 2. Muscle strength. Assess ability to do isometric contraction of quadriceps and hamstrings and gross strength of ankle/hip and other extremities.
 - 3. Functional ability. Assess transfer ability.
 - 4. Gait. Initiate weight bearing as tolerated with appropriate assistive device; note amount of assistance required and distance ambulated.
 - B. Outpatient
 - 1. Range of motion. Assess gravity-assisted flexion of involved knee (limited to 30°). Note length of gastrocnemius-soleus and hamstring muscles.
 - 2. Muscle strength. Assess ability to do straight leg raise and gross strength of other groups.
 - 3. Functional ability. Evaluate transfers and functional ability at home.
 - 4. Gait. Evaluate assistive device and amount of assistance required.
- II. Precaution during evaluation. Knee immobilizer is not to be removed until physician approves.

Treatment/Goals

- I. Frequency
 - A. One to two times per day as inpatient.
 - B. One to three times per week as an outpatient to adjust program.

- II. Treatment techniques and goals
 - A. Inpatient
 - 1. **Treatment:** Instruct patient in Phase I exercises and ankle pumps in immobilizer. **Goals:** Maintain muscle strength and establish independent home program.
 - 2. **Treatment:** Initiate gait, weight bearing as tolerated, with crutches or walker on all surfaces.

Goal: Restore independent gait and functional endurance.

- B. Outpatient (one to three weeks postoperative)
 - 1. **Treatment:** Begin gravity-assisted knee flexion out of immobilizer, limiting flexion to 30°.

Goal: Increase knee range of motion to 30°.

2. **Treatment:** Begin Phase II exercises if patient can perform straight leg raise without lag and endurance is adequate (60 to 80 repetitions).

Goal: Improve quadriceps and lower extremity strength.

3. **Treatment:** Stretch hamstrings, gastrocnemius-soleus, and lateral retinaculum of involved extremity.

Goal: Improve flexibility.

4. Treatment: Mobilize patella of involved extremity.

Goal: Improve patellar excursion to facilitate full range of motion.

- C. Outpatient progression
 - 1. **Treatment:** Discontinue knee immobilizer when adequate quadriceps strength and knee control have been attained. Continue Phase II and progress to Phase III exercises, stretching, and range of motion exercises.

Goals: Improve quadriceps strength; achieve full knee range of motion.

2. Treatment: Initiate swimming and biking activities.

Goal: Return to functional activities.

3. **Treatment:** Initiate walking or jogging program when power is 80% of uninvolved extremity as measured isokinetically. Gradually progress to cutting activities and sports when power is 90% of uninvolved extremity.

Goals: Return to previous functional level; increase strength of quadriceps.

- III. Precautions during treatment
 - A. Remain on crutches until patient achieves -10° to 90° range of motion and can perform Phase II exercises with six to eight pounds.
 - B. During outpatient phase, patient should wear immobilizer when not exercising until adequate quadriceps control is achieved.
 - C. Avoid long arc quadriceps exercises until they are not painful.

Discharge

- I. Evaluation. Discharge patient when objectives have been achieved.
- II. Follow-up plan/referral. See patient after visits to physician as necessary.
- III. Home program. Provide written home program to continue emphasizing quadriceps strengthening.

Patient Example

Patient is a 28-year-old female two weeks status post left extensor realignment. Patient is wearing left knee immobilizer and is independent on crutches with weight bearing as tolerated. Knee active range of motion is 0° to 15° .

Goals: (2 weeks)

- 1. Patient will increase left knee flexion to 30° with gravity-assisted flexion exercise.
- 2. Patient will perform 6 to 8 sets of 10 repetitions straight leg raise without extensor lag.
Femur Fracture with Open Reduction Internal Fixation Protocol

Objectives

- I. Increase strength of involved extremity to within functional limits.
- II. Improve range of motion to normal/functional status.
- III. Re-establish independent gait without assistive device.
- IV. Return to previous functional activity level.
- V. Investigate home situation and coordinate discharge planning with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate
 - A. Postoperative inpatient
 - 1. Range of motion. Assess involved hip, knee, and ankle actively within limits of pain. Grossly assess other extremities.
 - 2. Muscle strength. Assess gross strength of all extremities.
 - 3. Neurological. Assess sensation in involved extremity.
 - 4. Functional ability. Evaluate bed mobility and transfer skills.
 - 5. Gait. Note assistive device, amount of assistance required, and distance ambulated.
 - 6. Cardiorespiratory. Note pre-existing limitations, ability to deep breathe, heart rate, and blood pressure response to upright position.
 - B. Outpatient
 - 1. Range of motion. Assess specific range of involved hip, knee, and ankle.
 - 2. Muscle strength. Specifically test involved extremity.
 - 3. Gait. Analyze pattern, weight-bearing status, and assistive device used.
 - 4. Functional ability. Evaluate transfers and functional level at home.
- II. Precaution during evaluation. Patient is usually non-weight bearing initially, unless specified otherwise.

Treatment/Goals

- I. Frequency
 - A. Inpatients should be seen twice a day, if possible.
 - B. Outpatients should be scheduled as necessary to monitor and advance program.

- II. Treatment techniques and goals
 - A. Postoperative inpatient
 - 1. Treatment: Instruct in Phase I exercises. Issue written home program.

Goals: Initiate independent exercise program; improve range of motion and strength of lower extremity.

2. **Treatment:** Begin non-weight bearing gait training in parallel bars, progressing to crutches or walker. Include stairs, curbs, and ramps.

Goal: Establish independent gait with assistive device on all surfaces.

- B. Outpatient (four to six weeks postoperative)
 - 1. **Treatment:** Progress to Phase II exercises when patient can perform straight leg raise without lag and is able to do 60 to 80 repetitions of Phase I exercises.

Goal: Improve lower extremity strength.

2. Treatment: Initiate stretching of involved extremity.

Goal: Increase lower extremity range of motion.

3. **Treatment:** Teach partial weight-bearing gait when fracture has healed adequately, range is adequate (-15° to -20° knee extension), and strength is adequate (Phase II), per physician.

Goal: Facilitate independent gait with partial weight bearing on all surfaces.

4. **Treatment:** Incorporate stationary bicycle and swimming into program when patient has adequate knee range of motion (-10° to 90°) and partial weight-bearing status has been achieved.

Goals: Improve range of motion and strength in involved lower extremity.

- C. Progression of outpatient rehabilitation
 - 1. **Treatment:** Isokinetic exercise equipment and gym equipment is initiated when patient can perform Phase II exercises with ten pounds for males and eight pounds for females and when adequate healing of fracture is evident.

Goal: Improve lower extremity strength.

2. Treatment: Continue stretching activities.

Goal: Achieve functional range in involved lower extremity.

3. **Treatment:** Encourage weight-bearing as tolerated gait and gradually progress off assistive device when physician orders. (Criteria are no limp, -10° to 90° knee range of motion, and healing of fracture.)

Goal: Achieve independent gait without assistive device.

4. **Treatment:** Introduce standard bicycle when patient is ambulating without assistive device; initiate walking or jogging program when strength and power are 80% of uninvolved leg measured isokinetically; initiate sports activities and cutting when strength and power are 90% of uninvolved leg.

Goals: Improve strength and range of motion to within functional limits; return to previous functional activity level.

III. Precautions during treatment

- A. Maintain neutral position of hip during static and dynamic activities to prevent asymmetrical muscle forces on fracture site.
- B. Adequate fracture healing must be present before permitting exercise on equipment, weight-bearing gait, or functional activities.

Discharge

- I. Evaluation. Make a final assessment of patient's functional level, gait, range of motion, and strength.
- II. Follow-up plan/referral. See patient after visits to physician as necessary.
- III. Home program. Provide written home exercise program.

Patient Example

Patient is a 45-year-old male who fell and broke his right femur. He was referred to therapy for gait training, non-weight bearing on right, and exercises. Upon initial evaluation, patient ambulated 12 feet twice in the parallel bars non-weight bearing right with minimal assist. Patient was able to transfer from sit-to-stand and back with minimal assist and from sit-to-supine and back with minimal to moderate assist.

Goals: (4 days)

- 1. Patient will ambulate independently with walker non-weight bearing right on level surfaces and up and down stairs.
- 2. Patient will transfer independently sit-to-stand and back.
- 3. Patient will achieve independent bed mobility.
- 4. Patient will follow through independently with home exercise program.

Femoral Neck Fracture Protocol

- I. Increase strength of involved extremity to within functional limits.
- II. Improve range of motion to normal functional status.
- III. Establish independent gait without assistive device.
- IV. Provide equipment and posthospital care as necessary.
- V. Coordinate care with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate
 - A. Postoperative evaluation
 - 1. Two to three days postoperative
 - a. Evaluate gross muscle strength and range of motion of other extremities.
 - b. Observe gross muscle strength of involved extremity by strength of isometric muscle contractions.
 - c. Assess sensation of involved extremity.
 - d. Assess range of motion of involved hip within limits of pain.
 - 2. Three to five days postoperative
 - a. Evaluate gait pattern with assistive device.
 - b. Evaluate functional ability with regard to transfers and bed mobility.
 - c. Continue to evaluate gross strength of involved extremity.
 - B. Outpatient evaluation
 - 1. Complete specific muscle tests on all groups.
 - 2. Test range of motion of hip, knee, and ankle.
 - 3. Analyze gait.
 - 4. Evaluate functional ability.
 - Complete specific tests, including Functional Ambulation Profile and Get Up & Go Test. (Reference: Mathias, S., U. S. Nayak, and B. Issacs. 1986. Balance in elderly patients: The "get up and go" test. Archives of Physical Medicine and Rehabilitation 67(6):387-389.)
- II. Precautions during evaluation
 - A. Weight-bearing status must be determined by physician.
 - B. Assess cardiac status prior to initiation of evaluation.

Treatment/Goals

- I. Frequency
 - A. Inpatients should be seen daily, twice if possible.
 - B. Outpatients are followed as necessary.
- II. Treatment techniques and goals
 - A. Two to three days postoperative
 - 1. Treatment: Instruct patient in deep breathing and cough.

Goal: Prevent postoperative pneumonia and atelectasis.

2. Treatment: Initiate isometrics and ankle pumps with involved extremity.

Goal: Prepare patient for active exercise program.

3. **Treatment:** Initiate bedside sitting once physician has cleared patient for this activity.

Goal: Prepare patient to begin transfer and progressive gait training processes.

- B. Three to five days postoperative
 - 1. **Treatment:** Gait train patient, observing weight-bearing precautions. Progress to walker or crutches.

Goal: Establish independent gait with assistive device, using proper gait pattern on all surfaces and stairs.

2. **Treatment:** Initiate training in activities of daily living, including bed mobility and transfers to and from bed and toilet.

Goal: Achieve independence with all transfers.

- 3. **Treatment:** Initiate active range of motion/strengthening program. Individualize exercise program according to each patient's needs, but generally include the following.
 - a. Supine: hip abduction and adduction, gluteal sets, quadriceps sets, straight leg raise, hip and knee flexion, short arc quadriceps, internal and external rotation.
 - b. Sitting: Long arc quadriceps, hip flexion, ankle pumps.

Goals: Increase strength of involved extremity; increase independence with exercise program.

III. Equipment

- A. Bilateral support assistive devices (crutches or walker).
- B. Other adaptive equipment as necessary for independence.
- IV. General considerations
 - A. Evaluate patient's home situation to determine need for additional equipment, home health physical therapy services, or other support.
 - B. Request physician consult for necessary equipment or other needs.

Discharge

- I. Evaluation. Make final assessment of patient's functional level, gait, range of motion, and strength.
- II. Follow-up plan/referral
 - A. Continue outpatient physical therapy program as indicated.
 - B. Initiate home health physical therapy services when indicated.

III. Home program

- A. Educate patient and family on exercise program.
- B. Provide written home exercise program.

Patient Example

Patient is a 63-year-old male presenting with left hip fracture with open reduction internal fixation. Orders are for gait training (weight bearing as tolerated on left) and exercise.

Goals: (1 week)

- 1. Patient will ambulate with a standard walker, bearing weight as tolerated on left with standby assist for 50 feet one time.
- 2. Patient will perform lower extremity strengthening exercises and bed mobility independently.

Nonarthroscopic Meniscectomy Protocol

Objectives

- I. Increase strength, power, and endurance of involved musculature to at least 90% of uninvolved extremity.
- II. Return to normal range of motion.
- III. Return to functional activities as strength and range of motion dictate.

Admission/Evaluation

- I. Areas to evaluate
 - A. Inpatient evaluation
 - 1. Evaluate gross range of motion of uninvolved extremities, and hip and ankle of involved extremity. (Involved knee is usually immobilized immediately post-operative.)
 - 2. Evaluate gross motor strength of uninvolved extremities and hip and ankle of involved extremity.
 - 3. Evaluate musculature around knee by ability to do straight leg raise and hamstring sets.
 - 4. Evaluate functional ability.
 - B. Outpatient evaluation
 - 1. Evaluate range of motion of involved knee.
 - 2. Evaluate muscle strength of involved musculature. Initially, evaluate muscle strength by ability to do straight leg raise and by gross muscle testing. Once range of motion is pain-free, evaluate muscle strength isokinetically.
 - 3. Evaluate functional ability.
 - 4. Note cardiac and respiratory status.
- II. Precaution during evaluation. Take precautions in the presence of associated pathology as needed.

Treatment/Goals

- I. Frequency
 - A. See as inpatient for instruction in Phase I exercises and crutch training as necessary.
 - B. See outpatients after scheduled visits to physician. Follow outpatients on a regular basis if specific problems exist that cannot be eliminated with home program.

- II. Treatment techniques and goals
 - A. Inpatient program
 - Treatment: Instruct patient in Phase I exercises in posterior splint.
 Goal: Maintain strength.
 - 2. **Treatment:** Introduce touch-down weight-bearing gait with lateral supports. **Goal:** Establish independent ambulation.
 - B. Outpatient program (ten days to two weeks)
 - 1. **Treatment:** Remove splint and initiate range of motion. **Goal:** Increase knee range of motion.
 - 2. **Treatment:** Progress to Phase II when patient is able to do straight leg raises without lag and endurance is adequate (60 to 80 repetitions).

Goal: Improve strength of knee musculature.

3. Treatment: Weight-bearing gait as tolerated with lateral supports.

Goal: Wean off assistive device.

4. **Treatment:** Initiate swimming.

Goal: Improve range of motion, strength, endurance, and function of knee.

C. Progression of treatment

1. **Treatment:** Initiate lower extremity stretching program and continue range of motion.

Goal: Improve flexibility.

2. **Treatment:** Continue strengthening exercises and progress to isokinetic exercise equipment or gym equipment when strength is adequate (ten pounds with exercise for males, eight pounds for females).

Goal: Improve strength.

3. **Treatment:** Discontinue crutches when range is -10° to 90°, strength is adequate, patient no longer limps, and physician gives clearance.

Goal: Establish independent gait without assistive device.

4. **Treatment:** Introduce stationary bicycle when 90° of knee flexion is achieved and regular bicycle when crutches are discontinued.

Goal: Regain functional ability.

- 5. Treatment:
 - a. Initiate walking or jogging program when strength and power of involved leg are 80% of uninvolved leg as measured isokinetically.
 - b. Introduce figure eights and cutting activities when strength and power of affected limb are 90% of uninvolved limb.
 - c. Patient may begin noncompetitive and competitive sports when strength and power are at 90%.

Goals: Increase strength to 90% of uninvolved leg; achieve normal range of motion; return to previous functional level.

III. Precaution during treatment. Do not begin range of motion until posterior splint has been removed.

Discharge

- I. Evaluation. Discharge from physical therapy when objectives have been met.
- II. Home program. Place patient on maintenance exercise program.

Patient Example

Patient is a 36-year-old male two weeks status post nonarthroscopic meniscectomy.

- **Goals:** (1 week) Patient will perform Phase I exercises (6 to 8 sets of 10 repetitions) without extensor lag.
 - (2 weeks) Patient will initiate swimming program to increase range of motion, strength, and endurance.

Posterior Cruciate Ligament Repair or Reconstruction Protocol

Objectives

- I. Increase strength, power, and endurance of involved musculature to at least 90% of uninvolved extremity.
- II. Achieve normal range of motion.
- III. Return to functional activities as healing of repair and return of strength and range of motion dictate.

Admission/Evaluation

- I. Areas to evaluate
 - A. Inpatient evaluation
 - 1. Range of motion
 - a. Measure gross range of uninvolved extremities.
 - b. Involved extremity is usually in long leg cast immediately postoperative. Transarticular or proximal tibial pin may be present.
 - 2. Muscle strength
 - a. Evaluate gross strength of uninvolved extremities.
 - b. Evaluate quadriceps control and ability to do straight leg raise on involved extremity.
 - 3. Assess functional ability.
 - 4. Evaluate cardiac and respiratory status, if indicated.
 - B. Outpatient evaluation
 - 1. Range of motion. Assess involved knee.
 - 2. Muscle strength
 - a. Assess involved knee grossly (see Precautions during Evaluation).
 - b. Assess ability to do straight leg raise.
 - 3. Assess functional ability.
 - 4. Evaluate cardiac and respiratory status, if indicated.
 - 5. Gait. Evaluate need for assistive device and gait pattern.
- II. Precaution during evaluation. Eliminate hamstring muscle contractions.

Treatment/Goals

- I. Frequency
 - A. See inpatients daily for gait and Phase I exercises, as indicated.
 - B. See outpatients on a more regular basis if specific problems exist that cannot be eliminated with a home program.
- II. Treatment techniques and goals
 - A. Inpatient program
 - 1. **Treatment:** With patient in long leg cast, instruct in Phase I exercises, eliminating hamstring exercises. (Complete quadriceps sets, gluteal sets, gastrocnemius sets, straight leg raise, hip adduction and abduction.)

Goals: Perform Phase I exercises independently; accomplish straight leg raise without extensor lag; increase strength.

2. Treatment: Train non-weight-bearing gait with lateral support.

Goals: Achieve independent non-weight-bearing gait on level surfaces and stairs.

- B. Outpatient program (six weeks to nine months)
 - 1. **Treatment:** Pin is removed at six weeks (if present). Leg is placed in long leg brace with limits set by physician. Range limits should be increased every two to three weeks by physician.

Goal: Increase range of motion within limits of brace.

2. **Treatment:** Progress to Phase II exercises when control and endurance are adequate with minimal pain and joint effusion. (Patient can do straight leg raise without lag and 60 to 80 repetitions of Phase I exercises.) *Hamstring exercises are eliminated.*

Goal: Perform Phase II exercises independently with appropriate resistance to improve strength.

3. **Treatment:** Progress to isokinetic exercise equipment or gym equipment when strength is adequate (ten pounds with exercises for males, eight pounds for females).

Goal: Improve strength and coordination.

- 4. **Treatment:** Work on range of motion within limits of brace and patellar mobility. **Goal:** Improve range of motion.
- 5. Treatment:
 - a. Begin partial weight-bearing gait with crutches.
 - b. Progress off crutches when range is adequate $(-10^{\circ} \text{ to } 90^{\circ})$, patient has no limp, and patient can lift six to eight pounds with exercises.

Goal: Establish independent gait without limp or assistive device.

- C. Outpatient program (9 to 12 months)
 - 1. **Treatment:** Remove brace.
 - a. Continue work on range of motion and patellar mobility.
 - b. Initiate stretching if indicated.

Goal: Maintain flexibility and muscle length.

2. Treatment:

- a. Continue work on strengthening using Phase II exercises, isokinetic exercise equipment, or gym equipment.
- b. Hamstring exercises are still contraindicated.

Goal: Increase strength.

3. Treatment: Initiate biking and swimming.

Goal: Improve strength and endurance.

4. Treatment: Begin agility drills and jumping rope.

Goal: Return to functional activities.

- D. Outpatient program (12 months)
 - 1. Treatment: Begin hamstring exercises.

Goal: Restore functional strength of hamstring musculature.

- 2. **Treatment:** Use isokinetic testing to document strength, power, and endurance.
- 3. **Treatment:** Progress to walking and jogging when strength and power reach 80% of uninvolved extremity isokinetically.
- 4. **Treatment:** Progress to figure eights and cutting activities when strength and power reach 90% of uninvolved extremity.
- 5. **Treatment:** Progress gradually to noncompetitive sports then competitive sports when strength and power are 90% of uninvolved extremity.

Goal: Achieve maximal functional ability.

- E. Special cases: Tibial bone avulsion treated with open reduction internal fixation
 - 1. Cast is usually removed at six weeks. Begin standard Phase I program, with no hamstrings exercises.
 - 2. At three months, begin hamstring stretching.
- III. Precautions during treatment
 - A. Avoid hamstring exercises prior to one year except for special cases.
 - B. Return to functional activities (biking, swimming, jogging, recreational sports) only when strength, power, endurance, and healing are adequate.

Discharge

- I. Evaluation. Patient is discharged from physical therapy once objectives have been met.
- II. Home program. Place patient on maintenance home exercise program emphasizing quadriceps and hamstrings when appropriate.

Patient Example

Patient is a 25-year-old male presenting with right posterior cruciate ligament repair one year ago. Isokinetic strength test showed the strength of the hamstrings of involved knee to be within 65% of uninvolved knee.

Goals: (3 to 6 weeks)

- 1. Patient will become independent with Phase II exercises at home and Phase III exercises on isokinetic exercise equipment or gym equipment.
- 2. Patient will increase strength of involved knee to within 80% of uninvolved knee as verified isokinetically.
- 3. Patient will progress to independent walking or jogging program.

Radial Head Nondisplaced Fracture Protocol

Objectives

- I. Return to normal range of motion.
- II. Increase strength, power, and endurance of involved musculature to at least 90% of uninvolved extremity.
- III. Return to activities of daily living involving upper extremities once adequate healing, adequate range of motion, and normal muscle strength are present.

Admission/Evaluation

- I. Areas to evaluate
 - A. Range of motion. Measure active range of motion of involved shoulder, elbow, forearm, wrist, and hand.
 - B. Muscle strength. Test patient's ability to perform active exercise.
- II. Precautions during evaluation
 - A. Do not perform passive range of motion of elbow or forearm either until six months after injury or until approved by physician.
 - B. Patient in acute phase must wear posterior splint at all times except during exercise.

Treatment/Goals

- I. Frequency
 - A. See inpatients until independent in active range of motion exercises for shoulder, elbow, forearm, wrist, and hand.
 - B. Follow patient's progress as outpatient and begin individualized rehabilitation program.
 - C. Follow outpatients on a regular basis if specific problems exist that cannot be eliminated with a home program.

II. Treatment techniques and goals

- A. Inpatient program in acute phase
 - 1. **Treatment:** Instruct patient in active range of motion for shoulder, elbow, forearm, wrist, and hand.

Goal: Increase range of motion in affected and surrounding joints.

2. **Treatment:** Perform passive range of motion on shoulder, wrist, and hand, if indicated.

Goal: Prevent loss of motion in surrounding joints.

3. **Treatment:** Place extremity in splint once exercises are completed. Instruct patient in splint application.

Goal: Protect fracture site.

4. **Treatment:** Instruct patient to use ice before and after performing exercises.

Goal: Decrease pain.

- B. Outpatient program
 - 1. **Treatment:** Progress patient to resistive exercise program with equipment once range of motion is adequate and fracture site is healed.

Goal: Increase muscle strength.

2. **Treatment:** Return to activities of daily living once range of motion is adequate and strength, power, and endurance are approximately 90% (tested isokinetic-ally) or muscle strength is normal in all major groups (indicated by specific muscle test).

Goals: Modify home program to address specific deficits; determine patient's ability to return to preinjury activity level.

- III. Precautions during treatment
 - A. Do not perform passive motion at elbow or forearm until six months after injury, unless approved by physician.
 - B. Do not perform resistive strengthening until range of motion is within normal limits actively and fracture site is healed.

Discharge

- I. Evaluation. Discharge patient from physical therapy once objectives have been met.
- II. Home program. Place patient on maintenance home exercise program to maintain strength and flexibility.

Patient Example

Patient is a 15-year-old male three days status post right radial head non-displaced fracture. Shoulder, wrist, and hand range of motion are within normal limits. Right elbow active range of motion is 45° to 90° .

Goals: (3 weeks)

- 1. Patient will perform active range of motion on right shoulder, elbow, wrist, and hand.
- 2. Patient will increase elbow active range of motion to full extension and flexion.

Sacro-Iliac Pain Protocol

Objectives

- I. Achieve level pelvis.
- II. Decrease pain.
- III. Return to functional activities of daily living.

Admission/Evaluation

- I. Areas to evaluate
 - A. Posture. Evaluate pelvic levels: PSIS, ASIS, iliac crests, greater trochanters, pubic symphysis.
 - B. Evaluate sacral sulcus depths.
 - C. Assess sacro-iliac tracking in standing and sitting.
 - D. Soft tissue. Note areas of point tenderness, edema, and asymmetry.
 - E. Evaluate muscle strength of trunk and lower extremities.
 - F. Measure leg length in supine and long sitting.
- II. Precautions during evaluation. Patient may experience increased soreness after extensive evaluation, so the evaluation may have to be done in several sessions.

Treatment/Goals

- I. Frequency
 - A. Follow outpatients receiving acute treatment three times per week for pain control and exercise.
 - B. As pain decreases, decrease frequency of treatment to two times per week and place patient on independent home exercise program.
- II. Treatment techniques and goals
 - A. Treatment of acute inflammation and pain
 - 1. Acute treatment
 - a. **Treatment:** Perform ultrasound/electrical stimulation to sacral sulci followed by mobilization of appropriate ileum. May try TENS or ice for pain control.
 - b. Treatment: Begin muscle strengthening and stretching tight structures.
 - c. Treatment: Issue sacro-iliac belt.
 - d. Treatment: Place on walking program within limits of patient's symptoms.
 Goals: Decrease pain; establish level pelvis.

- 2. Subacute treatment
 - a. Treatment: Wean from sacro-iliac belt, checking that pelvis remains level.
 - b. Treatment: Increase number of repetitions of exercises.
 - c. Treatment: Increase walking distance and time.

Goals: Improve muscle strength and aerobic fitness level to within normal limits.

- B. Treatment of anterior displaced ileum
 - 1. Treatment: Mobilization
 - a. Perform bilateral pelvic rock.
 - b. Use physical therapist squeeze—use of hamstrings eccentrically on involved side.
 - c. Use resisted hip extension and knee extension to strengthen gluteals and hamstrings on involved side.
 - 2. **Treatment:** Strengthen other lower extremity muscles, including abdominals, hip abductors and adductors, gluteals, and hamstrings.
 - 3. Treatment: Stretch hip capsule, piriformis, and iliotibial band.

Goals: Establish level pelvis; initiate independent home exercise program; increase muscle strength to normal.

- C. Treatment of posterior displaced ilium
 - 1. Treatment: Mobilization
 - a. Perform isometric hip flexion with hips and knees at 90°, using iliacus and iliopsoas on involved side.
 - b. Perform isometric hip adduction with hips and knees at 90°. Place forearm between knees.
 - c. Perform isometric hip flexion with hip and knee of involved side at 90°. Place uninvolved lower extremity over edge of table for resisted hip adduction.
 - 2. **Treatment:** Strengthen other muscle groups, especially abdominals, hip flexors, hip abductors and adductors, gluteals, and hamstrings.
 - 3. Treatment: Stretch hip capsule, piriformis, and hamstrings.

Goals: Establish level pelvis; promote independent exercise program; increase muscle strength to normal.

- III. Precautions during treatment
 - A. Return to functional activities of daily living only when pelvis is level, muscle strength is at least 4/5, and patient is pain-free with activities.
 - B. Bike riding and jogging are contraindicated initially and if symptoms reoccur following these activities. Use sacro-iliac belt for these activities initially.
- IV. Equipment
 - A. Sacro-iliac belt
 - B. Heel lift

- V. General considerations
 - A. Acute episode will last approximately two weeks.
 - B. Subacute episode will last approximately four to six weeks.

Discharge

- I. Evaluation. Discharge patient from physical therapy once objectives have been met.
- II. Follow-up plan/referral. Initiate follow-up as necessary.
- III. Home program. Patient is to be placed on home exercise program for stretching of tight structures and strengthening of weak muscles.

Patient Example

Patient is a 29-year-old female with right anterior displaced ilium and pain in her right sacroiliac joint during weight-bearing activities.

Goals: (2 weeks)

- 1. Patient will exhibit equal ASIS and PSIS levels in standing.
- 2. Patient will follow through with independent home exercise program.

Shoulder Impingement Syndrome Protocol

Objectives

- I. Eliminate pain and inflammatory process.
- II. Return to normal range of motion, strength, and flexibility.
- III. Return to functional activities as healing process allows.

Admission/Evaluation

 $\gamma^{(h)}$

- I. Areas to evaluate
 - A. General impression
 - 1. Age
 - 2. Occupation
 - 3. Onset of symptoms
 - 4. Activities that increase pain
 - B. Range of motion. Document active versus passive range of motion and presence or absence of pain. (Painful arc is usually present between 80° to 120° of shoulder abduction).
 - C. Soft tissue. Evaluate location of pain, areas of tenderness, and type of end feel.
 - D. Posture
 - 1. Note position of arm at rest.
 - 2. View posterior level of involved shoulder compared to uninvolved shoulder.
 - E. Functional abilities
 - 1. Evaluate activities of daily living.
 - 2. Determine if injury relates to occupation.
 - F. Test for impingement syndrome by flexing arm 90°. Pain with resisted internal rotation in this position is positive for impingement syndrome.
 - G. Test the following tendons to identify specific involvement.
 - 1. The supraspinatus produces pain with resisted abduction.
 - 2. The infraspinatus produces pain with lateral rotation.
 - 3. The subscapularis produces pain with medial rotation.
 - 4. The biceps produce pain with elbow flexion and supination.
- II. Precautions during evaluation: None

Treatment/Goals

- I. Frequency
 - A. See patient on an outpatient basis, initially three times per week for ice, ultrasound, and exercise.
 - B. Place on home exercise program.
 - C. Gradually decrease frequency of treatments based on progression of home exercise program.
- II. Treatment techniques and goals (acute patients)
 - A. **Treatment:** Treat symptoms with rest, ice, ultrasound, TENS, phonophoresis (10% hydrocortisone), or iontophoresis (methylsalicylate) if indicated.

Goal: Decrease pain and inflammatory process.

B. **Treatment:** Perform minimal exercise: passive range of motion to active-assistive range of motion in pain-free range.

Goal: Increase range of motion.

C. Treatment: Use distraction and inferior glides and grades I and II mobilization.

Goal: Decrease pain and increase joint mobility.

D. **Treatment:** Provide patient with home program including instructions to use ice two or three times a day and to perform minimal passive to active-assistive exercise (wand exercise in home program in pain-free range).

Goals: Decrease pain; increase range of motion at home.

E. **Treatment:** As symptoms decrease, perform active-assistive range of motion to active range of motion in pain-free range.

Goal: Increase range of motion and strength.

F. **Treatment:** Perform resistive exercise (cuff weights, exercise band) when patient is pain-free and range of motion is restored to near preinjury levels.

Goal: Increase strength, power, endurance, and flexibility.

- III. Precautions during treatment (acute patients)
 - A. Caution patient to avoid shoulder flexion and abduction to 90° or greater in activities of daily living and sleep.
 - B. Caution patient to avoid repetitive motion of the shoulder at home and during activities of daily living.
- IV. General treatment principles
 - A. Treat inflammatory process first.
 - B. Emphasize gleno-humeral motion by exercising in supine.
 - C. Work for flexibility, strength, power, and endurance.
 - D. Use resistive exercise only when range of motion is nearly full and is pain-free.

Discharge

- I. Evaluation. Discharge patient once goals have been met.
- II. Home program
 - A. Place patient on home exercise program to maintain strength and flexibility.
 - B. Instruct patient to avoid repetitive activities and discourage overuse of involved shoulder.

Patient Example

Patient is a 40-year-old female with left shoulder impingement syndrome with decreased range of motion and pain upon elevation of left shoulder.

Goals: (1 to 2 weeks) Patient will achieve full pain-free active range of motion of left shoulder.

(3 to 4 weeks) Patient will begin isotonic exercise program with 1 pound weight for 6 to 8 sets of 10 repetitions.

Shoulder Reconstruction Protocol

Objectives

- I. Achieve functional range of motion.
- II. Increase muscle strength and endurance of involved extremity to at least 90% of uninvolved extremity.
- III. Assist patient to use involved extremity in activities of daily living once healing, range of motion, and muscle strength are adequate.

Admission/Evaluation

- I. Areas to evaluate
 - A. Range of motion. Test involved shoulder, elbow, forearm, wrist, and hand when cleared by physician.
 - B. Muscle strength. Test patient's ability to perform isometrics and active exercise when cleared by physician.
 - C. Sensation. Note deficits in involved extremity.
- II. Precautions during evaluation
 - A. Avoid active or passive shoulder external rotation, abduction, and extension in acute stage until four to six weeks postoperative.
 - B. Consult physician regarding specific precautions.

Treatment/Goals

- I. Frequency
 - A. Treat postoperative inpatients daily to initiate pendulum exercises for involved extremity and active range of motion to uninvolved joints.
 - B. Following discharge, see patient as an outpatient as needed to adjust home program.
 - C. When cleared by physician, see outpatients two or three times per week to increase range of motion and decrease pain, if present.
 - D. Test involved upper extremity isokinetically at six months postoperative.
- II. Treatment techniques and goals
 - A. Treatment: During the acute stage, place shoulder in immobilizer.

Goals: Decrease pain; minimize risk of tendon rupture.

B. **Treatment:** Initiate isometric and pendulum exercises for shoulder muscles, plus active range of motion for elbow, forearm, wrist, and hand during the acute stage.

Goals: Increase shoulder range of motion; maintain and promote range of motion of elbow, forearm, wrist, and hand; maintain muscle strength.

- C. Treatment: Discontinue immobilizer four to six weeks postoperatively.
 - 1. Initiate active exercise program including shoulder extension, abduction, and external rotation.
 - 2. Emphasize full range of motion and continue isometric program.

Goal: Increase muscle strength and range of motion.

D. **Treatment:** Progress to resistive program when patient is pain-free and functional range of motion is obtained.

Goal: Increase muscle strength.

E. **Treatment:** Progress to exercise equipment when patient is pain-free and adequate range of motion with good control is noted in resistive exercises.

Goals: Increase muscle strength; improve ability to perform functional activities.

F. Treatment:

- 1. Six months postoperatively, test involved upper extremity (isokinetically) to identify any specific areas of weakness.
- 2. Establish specific home program to improve areas of identified weakness.

Goals: Identify specific weaknesses; establish patient's ability to return to functional level of activity.

G. **Treatment:** Return to activities of daily living involving upper extremities once range of motion is functional and strength, power, and endurance are approximately 90% of uninvolved extremity tested isokinetically.

Goal: Return patient to functional level of activity within limits of injury.

- III. Precautions during treatment
 - A. Avoid extremes of shoulder abduction, external rotation, and extension past neutral for four to six weeks postoperative.
 - B. Exercise in supine position to support scapula and minimize abnormal scapulothoracic motion.
 - C. Perform shoulder internal and external rotation with involved extremity at side of the body.
 - D. Consult physician regarding specific precautions.
- IV. Equipment. Discontinue shoulder immobilizer four to six months postoperative.

Discharge

- I. Evaluation. Discharge patient from physical therapy once goals have been met.
- II. Follow-up plan/referral. Follow as outpatient if specific problems develop.
- III. Home program. Instruct patient in home exercise program to maintain range of motion and muscle strength.

Patient Example

Patient is a 43-year-old male status post left shoulder reconstruction.

- **Goals:** (2 to 4 days) Patient will initiate pendulum exercises to increase passive range of motion and promote relaxation.
 - (5 to 7 days) Patient will initiate shoulder isometrics to increase strength of shoulder musculature.

Temporomandibular Joint Pain Protocol

Objectives

- I. Control pain.
- II. Regain normal motion and mandibular osteokinematics.
- III. Restore functional muscle strength, length, and balance.
- IV. Educate patient regarding harmful habits, relaxation, and proper posture.

Admission/Evaluation

- I. Areas to evaluate
 - A. General impression. Taking a history is essential to identify the etiology and factors which may contribute to the problem.
 - 1. General history of the complaint
 - 2. Dental and medical history
 - 3. Previous temporomandibular joint (TMJ) treatment
 - 4. History of trauma
 - 5. Ear, head, and neck symptoms
 - 6. Habits (including clenching or grinding teeth, singing)
 - 7. Job-related activities
 - 8. Attempt to clarify emotional factors in the patient's background that may provoke habitual protrusion or muscular tension
 - B. Posture
 - 1. Body. Assess asymmetries, such as scoliosis, forward head, torticollis.
 - 2. Face
 - a. Assess asymmetry.
 - b. Look for short upper lip.
 - c. Look for signs of soft tissue stress, such as hypertrophied masseter, mentalis, or sternocleidomastoid muscles.
 - C. Range of motion
 - 1. Active range of motion
 - a. Observe oral depression (closure), elevation (opening), lateral deviation, protraction, and retraction for freedom of movement, range, symmetry, and pain.
 - b. Measurements can be taken in millimeters using a transparent ruler.
 - c. Elevation can also be measured by placing patient's knuckles between the upper and lower anterior teeth, with 2 to $2\frac{1}{2}$ knuckles considered normal.

- 2. Passive range of motion
 - a. Assess ligament damage.
 - i. Move the mandible laterally as far as possible.
 - ii. Ligamentous sprain exists if there is pain on the side opposite to the movement or if there is excessive movement to the opposite side.
 - b. End feel. Assess passive movement in all directions and note the type of end feel.
- 3. Joint play
 - a. Accessory movements include downward glide of the condyle and lateral movement.
 - b. Note mobility, pain, guarding, and spasm.
- D. Muscle strength
 - 1. General rules
 - a. Support the head to eliminate head movement.
 - b. Mouth should be opened about one centimeter.
 - c. Apply resistive force gradually to allow patient to build maximal resistance.
 - d. Avoid hand contact with the TMJ to prevent confusing symptoms arising from local pressure on the TMJ with symptoms arising from the muscle test.
 - 2. Muscle test
 - a. Resistive opening tests the lateral pterygoid muscles.
 - b. Resistive closing tests the masseter and the temporalis and medial pterygoid muscles.
 - c. Resisted lateral excursion tests the medial and lateral pterygoid muscles on the side opposite the resistance.
 - d. Resisted protrusion tests the medial and lateral pterygoids.
 - e. Resisted retraction tests the digastric muscle and posterior fibers of the temporalis.
- E. Soft tissue and skin
 - 1. Palpation
 - a. Muscle. Accessible muscles of the head and neck should be palpated for skin temperature, tenderness, muscle tone, swelling, skin moisture, and trigger point location.
 - b. Joint
 - i. Place tip of forefinger anterior to the tragus of the ear while patient opens and closes mouth repeatedly. At maximum opening a depression overlying the joint should be identified.
 - ii. Place tips of little fingers in external auditory canals bilaterally, with fingernails pointed posteriorly. Exert anterior pressure during opening to identify pain, tenderness, and abnormal condylar movement or position.

- 2. Auscultation. With or without a stethoscope, joint noises should be noted. May include clicks or crepitation.
- F. Neurological. The muscles of mastication, ligaments, and joint capsule/disc are innervated by the mandibular trunk of cranial nerve V (trigeminal). Assess skin sensation and chin and upper extremity reflexes.
- G. Oral cavity
 - 1. Tongue. Note size, rest position, function, and oral habits.
 - 2. Dentition. Note presence/absence of teeth, overbite, overjet, wear patterns, and color and texture of lingual tissues.
 - 3. Occlusion
 - a. The rest position of the mandible is such that optimal freeway space exists between teeth (that is, vertical dimension of rest).
 - b. Proper mandibular rest position depends on tongue position and muscle/joint proprioceptors.
- II. Precautions during evaluation
 - A. Many TMJ patients have other complaints and problems, so it is important to distinguish TMJ and postural problems and address them specifically.
 - B. Cervical spine involvement is common in patients with TMJ dysfunction, so a thorough evaluation of the neck may be indicated.

Treatment/Goals

- I. Frequency. Outpatients should be seen once or twice a week for three to six weeks.
- II. Treatment techniques and goals
 - A. Treatment: Utilize heat or cold, ultrasound, and TENS.

Goal: Decrease pain and inflammation.

- B. Treatment: Active stretch via mouth opening.
 - 1. Patient should be in a comfortable, relaxed, reclining position.
 - 2. Patient should warm up by gently opening and closing the mouth several times prior to stretching.
 - 3. Place tongue in contact with hard palate as posteriorly as possible, while keeping the mandible in a retruded position.
 - 4. Instruct patient to open mouth slowly and rhythmically within the available pain-free range ten times.
 - 5. Patient holds each open position for five seconds, followed by relaxation in the rest position for five seconds.

Goal: Increase mandibular movement.

C. **Treatment:** Initiate hold-relax neuromuscular facilitation exercises for opening, protrusion, retraction, and lateral deviation.

Goals: Increase mandibular movement; decrease muscle spasm.

- D. Treatment: Initiate mobilization techniques.
 - 1. Caudal traction
 - a. Place thumb in patient's mouth over inferior molars with fingers outside around jaw.
 - b. Stabilize head with other hand and apply traction caudally.
 - 2. Ventral glide—protrusion
 - a. Place index and third fingers around angle of ramus of mandible and rest of hand on jaw.
 - b. Stabilize head with other hand and glide mandible ventrally into protrusion.
 - 3. Medial-lateral glide
 - a. Place thumb in patient's mouth on medial aspect of body of mandible near inferior molars with fingers outside wrapped around jaw.
 - b. Stabilize head and move wrist ulnarly so condyle moves outward, forward, and laterally as mandible is moved medially.

Goal: Improve joint play movements.

E. Treatment:

- 1. Instruct patient in isometrics for opening, protrusion, and lateral excursion.
- 2. Patient performs isometrics in front of a mirror with mouth closed and teeth in light contact.
- 3. Progress to open mouth position.

Goal: Restore normal muscle strength and balance.

F. Treatment: Perform resisted opening at midrange.

Goal: Limit excessive opening through neuromuscular re-education.

G. Treatment:

- 1. Educate patient to avoid opening mouth wide, yawning, biting off large mouthfuls of hard food, habitual protrusion, clenching, and nocturnal bruxism.
- 2. Teach relaxation techniques, stress management, and postural control.

Goals: Avoid harmful habits; maintain proper posture independently.

- III. Precautions during treatment
 - A. Treatment should be based on specific evaluation findings and should begin with two or three activities. Additional activities can be added at each treatment session.
 - B. TMJ patients may be undergoing treatment from a dentist and oral surgeon simultaneously; if so, it is important to communicate with them.
- IV. Equipment. Patient may use occlusal splints or other devices prescribed by dentist.
- V. General considerations. Patient should be placed on home program as early as possible and monitored constantly for changes or problems.

Discharge

- I. Evaluation. Discharge patient once objectives have been met and patient is independent in home program.
- II. Follow-up plan/referral. Patient will be followed as an outpatient, if necessary.
- III. Home program. Include postural exercises, body mechanics, and specific TMJ activities.

Patient Example

Patient is a 25-year-old female two weeks post closed locked syndrome of left TMJ. Her TMJ is no longer locked, but her opening range of motion is only 2 cm., and she has 0 cm. right lateral deviation.

Goals: (1 week)

- 1. Patient will increase mouth opening by 1 cm. with tongue on roof of mouth.
- 2. Patient will increase right lateral deviation to 1 cm. with mouth open 1 cm.
This page left intentionally blank.

Total Hip Arthroplasty Protocol

Objectives

- I. Increase strength of involved extremity to within functional limits.
- II. Achieve normal range of motion.
- III. Restore independent gait without assistive device.
- IV. Investigate home situation and coordinate discharge planning with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate
 - A. Preoperative evaluation
 - 1. Range of motion. Perform gross test of all extremities.
 - 2. Muscle strength. Perform gross test of all extremities.
 - 3. Evaluate functional ability.
 - 4. Evaluate gait.
 - B. Postoperative evaluation
 - 1. Two to three days postoperative
 - a. Muscle strength. Complete gross assessment of involved extremity, observing strength of isometric muscle contractions.
 - b. Neurological. Check sensation of involved extremity.
 - c. Cardiac/respiratory. Check vital signs in resting and upright positions.
 - 2. Three to five days postoperative
 - a. Gait. Assess gait pattern with assistive device.
 - b. Function. Evaluate ability to transfer into and out of wheelchair.
 - c. Muscle strength. Re-evaluate gross strength of involved extremity regularly.
 - d. Range of motion. Assess involved hip within limitations imposed by surgical procedure.
 - C. Outpatient evaluation
 - 1. Muscle strength. Specifically test all muscle groups.
 - 2. Range of motion. Measure range of involved hip, knee, and ankle.
 - 3. Gait. Analyze gait pattern.
 - 4. Evaluate functional ability.
 - 5. Perform specific tests of leg length and observe for a Trendelenburg sign.
- II. Precautions for evaluation. Refer to treatment section.

Treatment/Goals

- I. Frequency
 - A. Inpatients should be seen daily.
 - 1. Preoperatively for evaluation, education, and exercise instruction
 - 2. Postoperatively for exercise, transfer training, and progressive gait training
 - B. Follow patient on outpatient basis. Home health or outpatient physical therapy may be arranged if specific problems exist that cannot be eliminated by home program *or* if patient needs close supervision to follow rehabilitation program.
- II. Treatment techniques and goals
 - A. Preoperative program
 - 1. **Treatment:** Educate patient regarding total hip arthroplasty precautions. **Goal:** Prevent dislocation of operated hip.
 - 2. **Treatment:** Instruct patient in total hip arthroplasty exercises for involved extremity.

Goal: Familiarize patient with exercises to be performed postoperatively.

3. Treatment: Instruct patient in walker or crutch gait.

Goal: Familiarize patient with assistive device.

- B. Postoperative program
 - 1. Two to three days postoperatively
 - a. Treatment: Review total hip arthroplasty precautions.

Goal: Prevent dislocation of operated hip.

- b. **Treatment:** Initiate isometrics and ankle pumps with involved extremity. **Goal:** Prepare patient for active exercise program.
- c. Treatment:
 - i. Begin progression to upright position with reclining wheelchair.
 - ii. Monitor vital signs.

Goal: Tolerate upright position for at least five minutes in preparation for gait.

- 2. Three to five days postoperative
 - a. Treatment:
 - i. Gait train patient with degree of weight bearing according to physician's order.
 - ii. Progress to walker or crutches.

Goal: Use assistive device and proper gait pattern on level surfaces and stairs.

b. **Treatment:** Initiate transfer training, including to and from bed and elevated toilet seat.

Goal: Achieve independence with all transfers, with understanding of total hip arthroplasty precautions.

c. **Treatment:** Initiate total hip arthroplasty exercise program based on surgical approach.

Goal: Increase strength of involved extremity to enable independent performance of exercises.

d. **Treatment:** Instruct patient in active range of motion of involved extremity, abiding by precautions.

Goal: Increase range of motion of involved hip to within protocol parameters.

3. Outpatient therapy

a. Treatment:

- i. Modify rehabilitation program to address deficits noted on specific muscle test and range of motion evaluation.
- ii. Pay particular attention to strengthening gluteus medius and maximus and increasing endurance.

Goals: Increase range of motion to at least 80% of involved hip; increase muscle strength until comparable to uninvolved groups; increase endurance.

b. Treatment:

- i. Introduce patient to cane once cleared by physician for full weight bearing.
- ii. Progress from cane once adequate strength is present.

Goal: Achieve independent gait with cane.

c. **Treatment:** Progress to functional activities: walking, recreational swimming, or golfing, as appropriate.

Goal: Return to previous level of function.

- III. Precautions during evaluation and treatment
 - A. Follow precautions according to surgical approach.
 - B. Specific precautions should be followed for approximately ten weeks or per physician recommendation.

IV. Equipment

- A. Bilateral assistive devices (crutches or walker)
- B. Elevated toilet seat
- C. Cane
- V. General considerations. Evaluate patient's home situation to determine need for additional equipment, home health physical therapy services, or other needs.

Discharge

- I. Evaluation. Complete final assessment of patient's functional level, gait, range of motion, and strength.
- II. Follow-up plan/referral
 - A. Schedule outpatient physical therapy as indicated.
 - B. Refer to home health physical therapy services as indicated.

III. Home program

- A. Educate family on total hip arthroplasty precautions.
- B. Provide written home exercise program.

Patient Example

Patient is a 66-year-old white female presenting with a left total hip arthroplasty, posterior approach. On initial evaluation, patient ambulated 12 feet one time in the parallel bars with maximum assist of 2. Patient transfers sit to stand and back, wheelchair to mat and back with maximum assist of 2. Requires moderate assist for sit to supine and back.

Short-Term Goals: (2 to 3 days)

- 1. Patient will ambulate approximately 50 feet with a walker, bearing weight as tolerated on the left with minimal standby assist.
- 2. Patient will transfer sit to stand and back with minimal or standby assist.
- 3. Patient will require minimal assist for bed mobility.
- 4. Patient will follow through independently with exercises and precautions

Long-Term Goals: (prior to discharge)

- 1. Patient will ambulate independently with walker, bearing weight as tolerated on the left, on level surfaces for 150 feet and up and down stairs.
- 2. Patient will manage all transfers and bed mobility independently.

Total Knee Arthroplasty Protocol

Objectives

- I. Increase strength of involved extremity to within functional limits.
- II. Obtain functional range of motion.
- III. Establish independent gait without assistive device.
- IV. Investigate home situation and coordinate discharge planning with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate
 - A. Preoperative evaluation
 - 1. Range of motion. Measure gross range of motion of all extremities.
 - 2. Muscle strength. Assess gross muscle strength of all extremities.
 - 3. Evaluate functional ability.
 - 4. Gait. Evaluate amount of assistance and assistive device required.
 - B. Postoperative evaluation
 - 1. One day postoperatively
 - a. Evaluate gross muscle strength of involved extremity, emphasizing quadriceps control and ability to do straight leg raise.
 - b. Evaluate sensation of involved extremity.
 - 2. Two to seven days postoperatively
 - a. Analyze gait pattern with assistive device and specified weight bearing.
 - b. Analyze functional ability with regard to transfers.
 - c. Continue evaluation of gross strength of involved extremity.
 - d. Assess range of motion of involved knee (to begin only when approved by physician).
 - C. Outpatient postoperative evaluation
 - 1. Assess range of motion of knee.
 - 2. Test muscle strength of all groups.
 - 3. Evaluate functional ability.
 - 4. Analyze gait.
 - 5. Assess flexibility.
- II. Precautions for evaluation: None

Treatment/Goals

- I. Frequency
 - A. Treat inpatients daily.
 - 1. See inpatients preoperatively for evaluation, exercise instruction, and education regarding postoperative precautions.
 - 2. See inpatients postoperatively for exercise, transfer training, and progressive gait training.
 - B. Follow patient on outpatient basis as necessary.
- II. Treatment techniques and goals
 - A. Preoperative program
 - 1. **Treatment:** Instruct patient in strengthening exercises for involved extremity. **Goal:** Familiarize patient with exercises to be performed postoperatively.
 - 2. Treatment: Educate patient regarding postoperative precautions.

Goal: Protect joint during acute rehabilitation phase.

3. Treatment: Instruct in walker or crutch gait.

Goal: Familiarize patient with assistive device.

- B. Postoperative program
 - 1. One day postoperative
 - a. **Treatment:** Initiate Phase I exercise program for involved lower extremity with knee immobilizer in place.
 - b. **Treatment:** Individualize exercise program according to each patient's needs.

Goal: Increase strength of involved extremity to independent performance of all exercises (especially straight leg raise) with knee immobilizer in place.

- 2. Two to seven days postoperative
 - a. Treatment:
 - i. Gait train patient with weight bearing as tolerated on involved extremity.
 - ii. Progress to walker, crutches, or cane.

Goal: Use assistive device and proper gait pattern independently.

b. Treatment: Initiate transfer training, including into and out of bed.

Goal: Complete all transfers independently.

c. **Treatment:** Progress to performance of exercises without knee immobilizer, with emphasis on straight leg raise.

Goal: Increase strength of involved extremity to independent performance of straight leg raise without extensor lag.

d. **Treatment:** Initiate gravity-assisted and active-assistive range of motion of involved knee once physician has documented that incision is stable enough to begin. (Ideally, a continuous passive-motion machine is also indicated at this time).

Goal: Increase knee flexion to 90° or greater.

3. Outpatient therapy

a. Treatment:

- i. Continue increasing range of motion in knee.
- ii. Increase flexion with stretching of quadriceps in sitting or prone.
- iii. Increase extension with hamstring and gastrocnemius stretching.

Goal: Obtain knee range of motion of 0° to 90° or greater.

b. **Treatment:** Progress patient to Phase II if adequate endurance (60 to 80 repetitions) and strength (straight leg raise without lag) are present.

Goal: Reestablish normal strength in all muscle groups as tested by standard muscle testing.

c. Treatment:

- i. Progress to cane once adequate strength (straight leg raise without lag) and range of motion (-10° extension) are present and gait is pain-free.
- ii. Progress off of cane once adequate range of motion (-10° extension) and strength (lifts two to three pounds with Phase II exercises) are present and gait is pain-free.

Goal: Attain independent ambulation without lateral supports.

d. **Treatment:** Return to functional activities: walking, swimming, exercise, and biking.

Goal: Return to previous level of function without pain.

- III. Precautions during treatment
 - A. Follow up until patient has adequate quadriceps control for joint protection (straight leg raise without extensor lag); time period is determined by physician.
 - B. Patient is to wear knee immobilizer during any and all ambulation and while asleep until cleared by physician.
- IV. Equipment
 - A. Knee immobilizer
 - B. Assistive devices (walker, crutches, or cane)
- V. General considerations
 - A. Evaluate patient's home situation to determine need for additional equipment or home health physical therapy services.
 - B. Request physician consult for necessary equipment.
 - C. Document range of motion and ambulatory status daily.

Discharge

- I. Evaluation. Complete final assessment of patient's functional level, gait, range of motion, and strength.
- II. Follow-up plan/referral
 - A. Continue outpatient physical therapy program as indicated.
 - B. Refer to home health physical therapy services when indicated.
- III. Home program. Provide written home exercise program.

Patient Example

Patient is a 56-year-old male with a two-year history of progressive right knee pain. Conventional therapy has not been effective. Patient now presents with right total knee arthroplasty. Referred to physical therapy for post op day #1 Phase I exercises, to begin gait training on post op day #2 (weight bearing as tolerated right) and to begin range of motion on post op day #3.

Short-Term Goals: (5-7 days)

- 1. Patient will perform exercises independently.
- 2. Patient will ambulate with walker for 100 feet on level surfaces.
- 3. Patient will exhibit independent bed mobility and sit-to-stand and back transfers.
- 4. Patient will increase range of motion by 5° to 7° every two days.

Long-Term Goals: (prior to discharge)

- 1. Patient will ambulate independently for 150 feet on level surfaces and up and down stairs with walker.
- 2. Patient will regain knee range of motion from 0° to 90°.



This page left intentionally blank.

Newborn Spina Bifida Protocol

Objectives

- I. Educate parents on appropriate handling (for example, prevention of hip dislocation), positioning, developmental activities, range of motion exercises, and necessary precautions due to lack of sensation.
- II. Facilitate normal developmental activities within limitations of neurological deficit.
- III. Reduce or prevent contractures due to muscle imbalance and prolonged passive positioning.
- IV. Re-evaluate functional level regularly.
- V. Investigate home situation and coordinate discharge planning with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate
 - A. General impression
 - 1. Patient history
 - 2. Associated problems
 - B. Range of motion
 - 1. Complete thorough upper and lower extremity assessment and, if medically cleared, trunk and neck assessment.
 - 2. Be aware that normal physiological flexion contractures exist in newborns.
 - C. Muscle strength
 - 1. Muscle activity is best assessed when infant is alert and active, even when crying or agitated.
 - 2. It is inappropriate to grade muscle strength in newborns. Muscle activity may be recorded as P = Present or A = Absent.
 - 3. Voluntary motion should be differentiated from reflexive movement.
 - a. Movement in response to stimulation around the face, chest, and shoulders is likely to be voluntary.
 - b. Involuntary muscle responses are reflexive in nature and stimulus dependent. They are the result of intact segmental spinal cord function and should not be interpreted as evidence of corticospinal tract integrity.
 - c. A stimulus-dependent flexor withdrawal is a commonly seen reflexive response.
 - 4. Muscle testing may be done prior to surgical repair and approximately ten days after surgery.

- 5. Medications, maternal anesthesia, increased cerebral pressure from hydrocephalus, and general fatigue may influence active movement.
- 6. Muscle functioning may not be equal bilaterally.
- D. Neurological
 - 1. Assess deep tendon reflexes and neonatal reflexes using available innervated musculature. Pay particular attention to infant's feeding ability, as these infants are at risk for cranial nerve damage from Arnold-Chiari malformation.
 - 2. Determination of the level of sensory innervation is best done when infant is in a quiet state.
 - a. Noxious stimulus can be applied, beginning distally, while looking for signs of central recognition (grimace, crying, startle responses).
 - b. Signs of cortical recognition of pain should not be confused with reflexive responses (such as flexor withdrawal).
 - 3. Also look for signs of hydrocephalus (see Precautions during Evaluation and Treatment).
- E. Cardiac and respiratory. Function may be influenced by innervation of respiratory musculature, as well as Arnold-Chiari malformation.
- F. Functional/developmental abilities. Include auditory and visual responses, gross motor, and fine motor.
- G. Skin and soft tissue
 - 1. Describe appearance and location of wound, positioning and handling precautions (if crying), type of dressing, and drainage.
 - 2. Note whether wound is surgically closed.
- H. Posture. Note asymmetries or spinal deformities (such as scoliosis).
- II. Precautions during evaluation and treatment
 - A. Status post repair and prior to repair
 - 1. Avoid excessive hip and pelvic flexion, as these movements may stress surgical site.
 - 2. Abide by prescribed positioning precautions (infant may be restricted to prone or sidelying initially).
 - 3. Do not allow stool to contaminate wound.
 - 4. Await medical clearance prior to initiating treatment.
 - 5. *Short* periods of supine and supported sitting should not affect most surgical closures—check with physician.
 - B. Status post ventricular peritoneal shunting
 - 1. Infants are generally on hold for approximately 24 hours with elevation of the head contraindicated. Check with physician before proceeding with treatment.
 - 2. Avoid inverted positioning until well healed.
 - 3. Avoid prolonged positioning on shunt area until healed.

- C. Possible hip dislocation
 - 1. Avoid lifting infant by legs for diaper changing.
 - 2. Avoid simultaneous adduction and flexion of the hips.
- D. Hydrocephalus/shunt malformations are possible. Signs and symptoms may include the following:
 - 1. Bulging fontanelle
 - 2. Vomiting
 - 3. Change in appetite
 - 4. "Sunset" sign of eyes
 - 5. Edema/redness/tenderness along shunt
 - 6. Lethargy
 - 7. Irritability
 - 8. High-pitched cry
 - 9. Seizures
- E. Hydromyelia
 - 1. The increased collection of cerebrospinal fluid in the spinal cord may cause pressure necrosis of peripheral nerve and muscle tissue, resulting in loss of muscle strength and associated scoliosis.
 - 2. Other signs of hydromyelia include progressive upper extremity weakness and hypertonus.
- F. Tethered cord
 - 1. Tethered cord usually occurs when the cord has become adhered at the level of the original surgical repair.
 - a. As the child grows, the cord stays "bound" and is unable to slide in the vertebral canal.
 - b. The inevitable stretching causes metabolic and ischemic degeneration in neural and muscle tissue, leading to a decline in muscle strength, scoliosis, or hypertonus.
 - 2. Like hydromyelia, a tethered cord requires surgical intervention. Findings that might suggest these problems should, therefore, be reported to a physician (for example, a decrease in motor function and scoliosis in a patient with lesion below T12).
- G. Occult fractures. Lack of sensation may prevent recognition of occult fractures, which are characterized by redness, local heat, swelling, deformity of limb, and fever.

Treatment/Goals

- I. Frequency. One time per day, less if family involvement and nursing follow-through is good.
- II. Treatment techniques and goals

A. Treatment:

- 1. Range of motion exercises should be done using short lever arms with good joint stabilization to prevent fractures or joint damage.
- 2. Contractures will occur due to muscle imbalances (innervated hip flexors and adductors without counter balancing by innervated hip extensors and abductors) and due to prolonged positioning (hip flexion, abduction, external rotation contractures due to repeated supine positioning). Range of motion exercises should be prescribed with this in mind.
- 3. Positioning and splinting may supplement range of motion exercises.

Goal: Maintain or increase range of motion as appropriate to minimize deformity.

B. **Treatment:** Assist nurses and parents with proper varied positioning to maintain skin integrity, as well as to facilitate developmental skills and assist with range of motion goals.

Goal: Prevent skin breakdown.

C. Treatment: Educate parents in home program.

Goals: Parental independence with home program; parents will understand sensory precautions, proper handling and positioning techniques for facilitating developmental skills, and will recognize shunt malformations.

III. Equipment. Provide equipment as needed for positioning and maintaining range of motion (for example, adduction strap for tight iliotibial bands).

Discharge

- I. Evaluation. Discharge patient when goals have been met. Document hospital course, including family involvement and referrals made.
- II. Follow-up plan/referral. Refer to infant stimulation program or outpatient physical therapy services as necessary.
- III. Home program. Provide written program of developmental activities, range of motion exercises, and positioning as needed; review signs and symptoms of shunt malfunction.

Patient Example

Patient is a one-week-old male with myelomeningocele at the thoracic level. Patient exhibits decreased tone in both lower extremities. Parents express anxiety over handling infant.

Goal: (1 week) Parents will demonstrate proper techniques for range of motion, positioning, and handling infant as outlined in the home program in order to promote infant-family bonding.

Nonorganic Failure to Thrive Protocol

Objectives

- I. Establish social skills appropriate for age of patient.
- II. Improve gross motor skills and muscle tone of patient.
- III. Educate family regarding interactive skills.
- IV. Investigate home situation and coordinate discharge planning with other disciplines.

Admission/Evaluation

- I. Areas to evaluate
 - A. General impression. Note infant's affect, past weight gains, parental presence, and social history.
 - B. Range of motion. Note asymmetry and possible hypermobility or hypomobility.
 - C. Strength. Posturing against gravity may indicate strength even when infant appears hypotonic.
 - D. Functional ability
 - 1. Give particular attention to the social skills of smiling, eye contact, and tracking. These skills may be best observed at a distance of several feet.
 - 2. Assess interactive communication. Language may be delayed or absent.
 - 3. Gross and fine motor skills
 - a. Fine motor skills are frequently at higher levels than gross motor skills.
 - b. Infant may tolerate supine position better than prone position and may have very poor prone and transitional skills.
 - c. Infant may appear unmotivated to move.
 - E. Gait
 - 1. Evaluate if gait is appropriate for age and developmental level of child.
 - 2. There are no known clusters of abnormalities with walking.
 - F. Neurological
 - 1. Asymmetry and imbalance of muscle tone are common. Tone may appear either higher or lower than normal, but tendon reflexes are rarely hyperactive.
 - 2. Reflexes. Frequently, infant may have good reflexes but seem too weak to perform corresponding gross motor skills. (For example, head righting reflexes are intact, but head control in prone position is poor.)
 - G. Cardiorespiratory. Respiration is rarely affected.

- H. Posture
 - 1. Note posture against gravity.
 - 2. Is any extremity held in an unusual position for long periods of time?
 - 3. Are hands and fingers kept in the mouth?
 - 4. Are antigravity positions held better in supine than in prone?
 - 5. Shielding of the face or eyes is indicative of severe problems.
 - I. Skin and soft tissue. Check for very loose skin folds, which indicate loss of subcutaneous fat.
- II. Precautions during evaluation
 - A. Note differences in infant's behavior when parents are and are not present.
 - B. Malnutrition may limit infant's endurance; therefore, initial evaluation may need to be brief.
 - C. Avoid overwhelming infant with stimulation or demands.

Treatment/Goals

I. Frequency

- A. Treat patients one to two times per day.
- B. Consider treatment six to seven days per week for severely affected patients.
- II. Treatment techniques and goals
 - A. Treatment: Social stimulation is the most important aspect of treatment.
 - 1. Approach infant from a distance, slowly moving into the field of vision.
 - 2. If infant achieves eye contact, reinforce with verbal praise. If infant withdraws or diverts or shields eyes, increase distance and resume verbal stimulation.
 - 3. Gradually decrease the distance as infant responds favorably.

Goals: Achieve eye contact, smiling, and vocalization.

- B. Treatment: Gross motor activities
 - 1. As infant improves in social interaction, begin work to improve motor skills.
 - 2. Don't overstress infant by introducing difficult tasks that may cause withdrawal.
 - 3. If infant prefers supine, introduce rolling to sidelying, and work on kicking in supine position. Prone skills are introduced later.
 - 4. If infant tolerates sitting, work on pivoting and transition from sitting to prone.
 - 5. Crawling, creeping, and standing may require too much handling in the early treatment stages.

Goal: Improve motor skills.

C. **Treatment:** Range of motion and inhibition techniques may be used to decrease abnormal posturing and improve postural alignment.

Goals: Improve postural symmetry and acquisition of motor skills.

D. Treatment: Instruct family in infant handling skills.

Goals: Provide family with skills to continue progress following discharge.

- III. Precautions during treatment
 - A. Avoid introducing toys into therapeutic activities until infant interacts with people.
 - B. Parents may not improve interaction with infant until infant is able to respond positively to stimulation.
 - C. Avoid overstimulation. Elicit a favorable response to every stimulus.
 - D. Be alert for reflux and rumination.
- IV. Equipment
 - A. An infant seat may be used to facilitate eye contact.
 - B. Avoid use of toys; person-to-person interaction is more effective.
 - V. General considerations
 - A. Severity of involvement will affect rate of progress and achievement of goals.
 - 1. In the most severe cases, infant avoids eye contact, may ruminate, lacks vocalization, and shields face with upper arm.
 - 2. In moderately severe cases, infant avoids eye contact, ruminates, and has decreased vocalization.
 - 3. In less severe cases, infant avoids eye contact and has decreased vocalization.
 - B. Smiling begins with softening of facial features, then turning up of corners of mouth. A smile with entire mouth follows third. In the final phase, the entire face reacts.

Discharge

I. Evaluation

- A. Note status of social skills, gross motor activities, posture, and tone.
- B. Note parental ability to handle and interact with infant.
- C. Note status of goals.
- II. Follow-up plan/referral
 - A. Reassess patient during outpatient visits.
 - B. Refer to local program if infant has organic problems or if parents need more assistance in handling infant.
- III. Home program
 - A. Emphasize positive interaction between parent and infant during feeding and non-feeding times.
 - B. Provide developmental activities appropriate to functional level of infant.

Patient Example

Patient is a six-month-old male diagnosed with failure to thrive. Patient exhibits decreased food intake and increased weight loss. When approached by anyone, including parents, patient avoids eye contact. During developmental testing, patient is noted to prefer supine positioning.

Goal: (1 week) Patient will maintain eye contact for 30 seconds on three out of five trials while positioned in sitting in order to facilitate development of normal socialization skills.

Pediatric Hemophilia Protocol

Objectives

- I. Prevent hemophilic arthropathy when possible.
- II. Minimize permanent deformity and restore joint and muscle function following localized hemorrhage.
- III. Educate patient and family in a home program of joint protection, exercise, and conditioning.

Admission/Evaluation

- I. Areas to evaluate
 - A. Prophylactic evaluation
 - 1. General impression. Note patient's past history of bleeds, including frequency and joints involved.
 - 2. Range of motion. Evaluate present active and passive range of motion.
 - 3. Strength
 - a. Perform gross manual muscle test for all groups.
 - b. Perform specific manual muscle test for problem joints.
 - c. Test involved joints isokinetically when an assessment of strength, power, and endurance is required.
 - 4. Neurological. Grossly check for abnormalities.
 - 5. Gait. Note any deviations, bracing, or assistive devices.
 - 6. Function. Determine general level of activity and how hemophilia affects activities of daily living.
 - 7. Skin and soft tissue. Examine extremities for hematomas, warmth, edema, ecchymosis, and muscle wasting.
 - 8. Posture. Note general posture and specific posture of involved extremity.
 - 9. Cardiac/respiratory. Note abnormalities.
 - 10. Check chart or check with physician for plasma factor VIII or IX levels.
 - B. Areas to evaluate postbleed
 - 1. General impression
 - a. Note patient's past history of bleeds.
 - b. Determine previous level of activity.
 - c. Identify factors precipitating bleed.
 - d. Identify usual state of joint.
 - e. Note patient's level of cooperation and pain tolerance.

- 2. Range of motion. Measure active motion only (see Precautions during Evaluation).
- 3. Strength
 - a. A specific manual muscle test is not indicated during recovery from a bleed.
 - b. Assess only active movement without resistance.
- 4. Neurological. Evaluate grossly for abnormalities or peripheral neuropathies.
- 5. Gait
 - a. If a lower extremity joint or muscle is involved, weight bearing is usually avoided. Check with physician.
 - b. If gait is allowed, assess quality, distance, lateral support, and gait pattern.
- 6. Function. Determine patient's level of function.
- 7. Skin and soft tissue. Examine extremities for hematomas, warmth, edema, ecchymosis, and muscle wasting.
- 8. Posture. Note general posture and posture of involved extremity. Assess need for splinting to maintain resting position and protect joint.
- 9. Cardiac/respiratory. Note abnormalities.
- 10. Check chart or check with physician for plasma factor VIII or IX levels.

II. Precautions during evaluation

- A. Do not force involved joints.
- B. Patient may be on bedrest.

Treatment/Goals

- I. Frequency
 - A. Prophylactic treatment. See patient for evaluation and home program, then for annual reassessments while problem-free.
 - B. Postbleed treatment
 - 1. Immediately after bleed see daily to monitor positioning and splinting.
 - 2. When factor level is adequate to begin exercise, see twice a day.
 - 3. After discharge, patient may be seen one to two times per week to progress exercise program.
- II. Treatment techniques and goals
 - A. Prophylactic treatment. Home program of Phase I, II, and III exercises for involved joint (see Orthopedic divider page for specific exercises).
 - 1. Phase I exercise consists of isometrics around involved joint, strengthening, and active range of motion.
 - 2. Phase II exercise adds progressive weights to Phase I exercises.
 - 3. Phase III is functional retraining of the involved joint.
 - 4. The home program should also include flexibility exercises when needed.
 - 5. Periodically reassess patient to advance exercises and re-evaluate strength and range. Increase frequency of treatment if patient compliance is a problem.

B. Treatment during recovery from a bleed

1. Hemarthrosis

- a. Splinting
 - i. **Treatment:** Immobilize joint in position patient has adopted. Do not force!
 - Goal: Prevent further loss of motion and protect the joint.
 - ii. **Treatment:** After replacement therapy has been given and bleeding has stopped, pain will decrease and range will increase. Modify splints as patient regains range of motion.
 - **Goals:** Maintain gains in range; protect the joint between exercise sessions.
 - iii. **Treatment:** Ideally, provide final splint in full extension for the knee or elbow and in dorsiflexion for the ankle. This splint is used as a resting or night splint.

Goal: Protect the joint and maintain range of motion while healing.

b. Ice

- i. **Treatment:** Use crushed ice in a towel for five to ten minutes six to eight times a day.
- ii. Carefully examine the skin for redness or pressure.
- iii. Use ice only on acute bleeds, not chronic bleeds.

Goal: Decrease pain and swelling.

- c. Progressive exercises
 - i. **Treatment:** When factor level is sufficient and pain has decreased, initiate exercise. Perform only isometrics for first one to two days of exercise.
 - ii. **Treatment:** If no recurrence of bleeding or increase in pain occurs with one or two days of isometrics, begin active-assistive range of motion exercises. Do not force joint.
 - iii. **Treatment:** When isometrics and active motion are performed with ease through sufficient repetitions (60 to 80), begin exercises with weights. May need to be part of a home or outpatient program.

Goals: Increase strength, range of motion, and joint function after a bleed; protect the joint from further bleeds.

- d. Gait. The patient is generally non-weight bearing initially.
 - i. Treatment: Progress gait training as physician approves.
 - ii. Partial weight bearing may be done with lateral support or in a swimming pool.
 - iii. Patient may require casting, splinting, or bracing prior to ambulation.
 - iv. Patients with a severe bleed and marked quadriceps atrophy may require bracing for as long as one year postbleed.

Goals: Protect joint; increase lower extremity strength and endurance; provide a means of mobility.

- 2. Hematoma
 - a. Splinting
 - i. **Treatment:** Immobilize with initial splint until hemorrhage has stopped.

Goals: Protect muscle; prevent further tightness.

ii. **Treatment:** Begin serial splinting after muscle is no longer firm and painful and factor level is adequate. Do not force joint.

Goals: Protect muscle; maintain range of motion attained in therapy sessions.

iii. **Treatment:** Final splint is a resting or night splint that maintains full muscle length.

Goals: Protect muscle; maintain range of motion.

- b. Ice
 - i. **Treatment:** Use crushed ice in a towel for five to ten minutes six to eight times a day.
 - ii. Carefully examine the skin for redness or pressure.
 - iii. Use ice only on acute bleeds, not chronic bleeds.

Goal: Decrease pain and swelling.

c. Treatment: Compression may be performed with elastic bandage wrapping.

Goal: Decrease edema.

- d. Progressive exercise. Exercise may be started when factor level is adequate and muscle is able to contract without pain.
 - i. **Treatment:** Progressive exercise of involved muscle using isometrics, active-assistive range of motion, active range of motion, then progressive resistive exercise.
 - ii. Stretch involved muscle. Begin by active contraction of the antagonist then progress to passive stretch.

Goals: Restore function; prevent future bleeds; increase range of motion, strength, and flexibility.

- e. Gait
 - i. Treatment: Patient may be non-weight bearing initially.
 - ii. Check with physician and instruct in appropriate gait pattern.
 - iii. Progress gait with physician approval.

Goals: Protect muscle; strengthen muscle as weight bearing is allowed.

- 3. Peripheral nerve palsy as a result of hematoma
 - a. Treatment: Splinting. Proceed as with hematoma.
 - b. Exercise
 - i. Treatment: Proceed as with hematoma.
 - ii. In addition, muscle re-education may be required for those muscles affected by the palsy.

- c. Ice
 - i. **Treatment:** Use crushed ice in a towel for five to ten minutes six to eight times a day.
 - ii. Carefully examine the skin for redness or pressure.
 - iii. Use ice only on acute bleeds, not chronic bleeds.

Goal: Decrease pain and swelling.

- d. Gait
 - i. Treatment: Proceed as for hematoma.
 - ii. In addition, bracing or lateral support may be required. Check with physician.
- III. Precautions during treatment
 - A. Factor levels
 - 1. Hemarthrosis. Plasma levels of factor VIII or IX must be 35% to 40% prior to exercise and mobility. Check with physician.
 - 2. Hematoma. Plasma levels of factor VIII or IX must be 25% to 30% prior to exercise and mobility. Check with physician.
 - B. Ice. Exercise caution with ice, as it may cause skin damage. Use protective layers.
 - C. Recurrence
 - 1. There is always a risk of rebleeding after range of motion and exercise have begun. Do not force range of motion.
 - 2. Encourage patients to comment on what they are feeling. Often they can feel a bleed when it first starts.
 - 3. Some patients with recurrent bleeds may require replacement therapy prior to each exercise session. Coordinate with physician.
 - D. Antibodies to factor VIII
 - 1. Patients with this problem will not be treated with replacement therapy and probably will not be able to exercise.
 - 2. Ice may help to relieve pain.
- IV. Equipment
 - A. Exercise equipment. Weights, surgical tubing, isokinetic exercise equipment, bike, swimming pool, and gym equipment
 - B. Elastic bandages
 - C. Ice
 - D. Biofeedback and electrical stimulation equipment may be used for muscle reeducation
- V. General considerations
 - A. Frequent, short exercise sessions are preferable.
 - B. Exercise must be individually planned.

- C. Patient may be discharged from hospital before strength and range of motion are satisfactory. For this reason, it is important to have a good home program and outpatient follow-up.
- D. Patients who are adequately replaced with factor level rapidly or who are aspirated may not have pain and joint changes requiring splinting.
- E. Hinge joints are most frequently involved in hemarthrosis because they do not allow for minor rotary and angulatory strains. The most commonly involved joint is the knee, followed by the elbow and ankle, respectively.
- F. Recommend that an orthopedic physician join the team, if one has not already been consulted.

Discharge

- I. Evaluation
 - A. Range of motion. Assess both active and passive motion.
 - B. Strength
 - 1. Assess present active motion.
 - 2. Perform manual muscle test if patient has progressed to resistive exercises.
 - C. Gait. Note gait pattern, deviations, and lateral support or bracing required.
 - D. Function. Determine patient's level of function.
 - E. Posture. Note involved extremity.
 - F. Skin and soft tissue. Note condition of involved joint or muscle.
- II. Follow-up plan/referral
 - A. Plan outpatient follow-up individually.
 - B. Progress exercise program from patient's capabilities at discharge until the patient's maximum rehabilitation potential is reached.
 - C. Follow patient for maintenance and periodic reassessments once full rehabilitative potential has been reached.
- III. Home program. Patient and family should be able to perform written and illustrated home exercise program to continue with rehabilitation program initiated in hospital.

Patient Example

Patient is an 11-year-old male with hemophilia. Patient was noted to have effusion in the left knee. Knee is noted to be tender to palpation and warm to touch.

Goal: (1 week) Patient will demonstrate independent, correct application of the knee splint in order to prevent further injury to the joint.

Premature Baby Protocol

Objectives

- I. Provide the compromised neonate with sensory input necessary for normal development of the sensory and motor systems.
- II. Prevent postural abnormalities by developing and implementing positioning programs.
- III. Assess the motor and neurologic maturity of the neonate by evaluating muscle tone, reflex development, motor skills, and sensory awareness.
- IV. Provide staff and parent education on positioning, handling, and therapeutic play to optimize development of infant.
- V. Make referrals to local programs when therapeutic intervention is indicated.
- VI. Periodically reassess infant following discharge to modify parent activities or to arrange additional therapeutic intervention.

Admission/Evaluation

- I. Areas to evaluate
 - A. General information
 - 1. Gestational/postconceptual age
 - 2. Perinatal problems
 - 3. Social situation
 - 4. Current medical status
 - 5. Occurrence of meconium aspiration or intraventricular hemorrhage
 - B. Range of motion (See Special Tests form and figures 1 and 2 for flexion contractures normally present in the full-term infant.)
 - 1. Premature infants have a progression of flexor tone development, and consequently, flexion contractures are dependent on the amount of tone present and the length of gestation.
 - 2. Relevant assessment of the premature infant includes the following.
 - a. Scarf sign. Measures the amount of passive shoulder flexion.
 - b. Popliteal angle
 - c. Dorsiflexion. The longer the gestation the greater the amount of dorsiflexion. A normal newborn's foot frequently touches the tibia.
 - d. Square corner
 - C. Functional ability
 - 1. States of arousal

States of Arousal

- I Deep sleep with regular breathing, eyes closed, no spontaneous activity, no eye movements.
- II Light sleep with eyes closed, rapid eye movements, irregular respiration.
- III Drowsy, semi-dozing, eyes open or closed, activity variable, movements usually smooth.
- IV Alert with bright look, minimal motor activity.
- V Eyes are open, considerable motor activity.
- VI Crying.
 - 2. Sensorimotor skills
 - a. Head and trunk control. (Refer to figure 2.)
 - i. Prone. Assess ability to lift head in prone or when held in ventral suspension.
 - ii. Sitting
 - (a) Anterior neck muscles are assessed during supine-to-sit movement.
 - (b) Extensor muscles (30-second intervals) are assessed by allowing head to fall forward and noting ability to elevate head.
 - iii. Standing. Assess ability to extend body in standing or when held at the level of examiner's shoulders.
 - b. Oral-motor skills. Assess after extubation by placing the pad of your small finger against infant's palate and noting strength and rhythm of suck and how long sucking is maintained.
 - c. Visual orientation
 - i. Present a red ball or ball of yarn at midline, six to nine inches in front of infant, who should be propped at a 20° angle.
 - ii. Move ball up and down, side to side, and in an arc.
 - iii. Infant should first focus on, and then follow the movement of, ball or yarn.
 - iv. Abnormalities may include the *sunset sign* (downward rotation of globe of eye), hypertonia of upper eyelids (cornea visible above the iris), strabismus, roving eye movements, nystagmus, or nerve palsy.
 - d. Auditory orientation
 - i. The environment should be quiet to allow infant to attend to stimulus.
 - ii. Prop infant at a 20° angle with head in midline.
 - iii. Shake a rattle four inches from each ear if infant is in an incubator, or ten inches from the ears if infant is in an open crib.
 - iv. Infant's behavior should change in response to stimulation. Abnormalities may include startle response or no response.

- 3. Irritability
 - a. Determine which kind of sensory stimulation distresses infant: tactile (when you touch lightly or firmly), vestibular (when head is moved), proprioceptive (with range of motion of the trunk or extremities), auditory, or visual.
 - b. Child may become irritable only when multiple stimuli are applied.
 - c. Determining how long stimulation can be given before child becomes irritable or has an undesired change in heart rate or oxygen saturation is important. (Indicates central nervous system maturity.)
- 4. Consolability
 - a. How easily can infant in State V arousal be calmed?
 - b. What type of sensory stimulation does child need to calm self? Is infant consoled by talking, swaddling, holding, pacifier or finger in mouth, patting on abdomen or back?

D. Neurological

- 1. General muscle tone
- 2. Frequency of startle responses
- 3. Presence of clonus (unsustained is normal in infants less than two months old) and Babinski reflexes.
- 4. Passive tone is determined by *extensibility* and amplitude of *flapping*.
 - a. Extensibility. Estimated angle following slow passive range of motion to the point of discomfort.
 - b. Flapping. Passive, rapid mobilization of a distal segment. (Indicates functional stability: movement against gravity, positioning needs, tone.)
 - c. Reflex evaluation can be used to assess peripheral nerve injuries, spinal cord injury, and the ability to move all extremities through full range of motion; look for asymmetries.
 - d. Reflex activity. Assess a ventilator-dependent infant in supine for the following reflexes: palmar grasp, traction, flexor withdrawal, crossed extension, ATNR, umbilical reflex (see Neonatal Positioning attachment).
 - e. Infants under an infant oxygen hood can be assessed in prone, supine, or sidelying.
 - f. Once infant is free from peripheral IVs and in an incubator or open crib, a full reflex test can be completed.
- E. Cardiorespiratory
 - 1. Monitor changes in heart and respiratory rates and oxygen saturation during handling.
 - 2. Heart rate should not change more than ten beats per minute, unless child initially is irritated and heart rate falls to a more normal level with handling.
 - 3. Oxygen saturation should never fall below 80% and preferably should not drop by more than 5%.

- 4. The level of supplemental oxygen and frequency of apnea and bradycardia should be noted. (Bradycardia is a pulse rate lower than 100; tachycardia is a pulse rate greater than 200.) Average preemie heart rate is 150, compared to an average full-term rate of 120 beats per minute.
- F. Postural alignment
 - 1. Amount of joint flexion is the key in an infant's posture in prone, supine, sidelying. It should be assessed if baby can be moved into these positions.
 - a. Gravity is an enemy of premature infants, and sidelying is the best position to reduce its effects.
 - b. Sidelying may not be possible with some oxygen saturation monitors, IVs, or in some babies with apnea.
 - 2. Flexion of all major joints is desired. (Joint flexion develops caudocephalic; flexor tone at 30 weeks, adductor tone at 32 weeks).
 - 3. Note when infant has enough shoulder and hip flexion to lift the hips and shoulders slightly off the supporting surface.
- G. Skin and soft tissue
 - 1. Carefully watch skin and soft tissue surrounding any IV or central line for inflammation because infection can quickly spread to cause a septic joint.
 - 2. Amount of subcutaneous fat determines when child can maintain body temperature. Infants without substantial fat should be kept under the warmer, in the incubator, or securely bundled at all times.
 - 3. Skin color indicates degree of oxygen saturation; be alert for blueness or pallor.
- II. Precautions during evaluation
 - A. Handling
 - 1. Infants should not be handled within one hour following gavage or oral feeding. A general rule is to handle infants in the second hour of a three-hour interval between feedings.
 - 2. Generally, infants on continuous drip feeding may be handled at any time.
 - B. Minimal stimulation
 - 1. Some infants are designated "minimal stimulation" by the nursing staff, indicating that they are unstable and respond poorly to handling.
 - 2. Consult the nursing staff prior to evaluating such an infant.
 - C. Oxygen saturation
 - 1. Cease handling infant if oxygen saturation cannot be maintained above 80%.
 - 2. Hypoxia can precipitate an intraventricular hemorrhage.
 - 3. The infant's oxygen saturation measurements should be documented for reference.
 - D. Sensory overload is to be avoided in the premature infant. Signs of overload include the following:
 - 1. Color fluctuation, including pallor, mottling, circumoral cyanosis, duskiness, or plethora (overfilling of blood vessels).

- 2. Cardiorespiratory alterations, including irregular respiration, hiccoughs, tachypnea, apnea, or bradycardia.
- 3. Motility, including stiffness of limbs, increased startling or jerky limb movements, regurgitation, or hypotonia.
- 4. Attention, including staring, gaze aversion, fussing, or crying.
- E. Avoid holding infant in knee-to-chest position because it may raise blood pressure and decrease oxygen saturation.
- F. Avoid hyperextension or hyperflexion of the neck, which may occlude small infant's airway.
- G. Growth and weight gain are top priorities for infant.
 - 1. Overstimulation and loss of body heat will slow growth.
 - 2. Infant needs to be kept warm during evaluation and treatment.
- H. Handle peripheral and central lines with exceptional care since infants are frequently dependent on them for very long periods of time.
- I. Premature infants are more difficult to arouse and calm because of poor protective responses and poor modulation of behavior.
- J. Stimulation is helpful only if infant responds appropriately.
- K. Check with physician regarding chest tube precautions.
- L. Avoid therapy immediately after other treatments.

Treatment/Goals

- I. Frequency. At least three times per week, preferably daily if tolerated.
- II. Treatment techniques and goals
 - A. Treatment: Range of motion exercises
 - 1. Take the joints through full range of motion if infant is unable to move against gravity or maintains abnormal postures due to abnormal tone or contractures.
 - 2. Painful joint range of motion indicates joint pathology and a need for immediate medical assessment.

Goals: Provide proprioceptive input; prevent loss of range of motion secondary to prolonged immobility.

- B. **Treatment:** Positioning. Swaddling infant inside a blanket with the extremities flexed provides external stability and limits sensory input, which improves feeding and visual skills. Rolled linens can be used to support proximal joints in at least 30° of flexion and the head in midline. Alternate between the following positions:
 - 1. Prone. Place rolls bilaterally under the head, hips, and shoulders, or unilaterally to hold infant in partial sidelying (modified prone).
 - 2. Supine. Place rolls under the back to support the upper extremities in shoulder flexion and under the knees to keep the hips and knees flexed.
 - 3. Sidelying. Place rolls in front of infant to draw it into more flexion; place a second roll behind infant to prevent extension. Sidelying is beneficial to reduce the extensor effects of gravity.

4. Infant seat or swing. Place a roll behind lumbar area and laterally to prevent scapular retraction or shoulder extension, and to support the head in midline.

Goals: Support the joints in physiologic positions and prevent malformation; position the joints in midrange where strength is greatest to allow infant as much voluntary movement as possible; reduce negative effects of gravity.

- C. Treatment: Arousal
 - 1. Infant should be aroused slowly from States I or II by gently patting the back or flexing the lower extremities and rocking the pelvis gently.
 - 2. As infant enters a lighter sleep state, add auditory input.
 - 3. Avoid suddenly rolling or picking up sleeping infant, because this movement is likely to startle infant into State V. States III and IV are optimal for motor, visual, and auditory skills. Stimulation should be modified to bring infant into an appropriate state and stopped when infant can no longer maintain the state.

Goal: Bring infant to an alert state in which it can benefit from therapeutic intervention.

- D. **Treatment:** Reflex facilitation. Stimulation of primitive reflex patterns strengthens movements and speeds development of tone and automatic movement patterns.
 - 1. Proprioceptive placing, palmar grasp, and traction will increase upper extremity flexion.
 - 2. Finger sequencing and avoidance reflexes develop finger extension and are used only after flexor tone is established.
 - 3. Proprioceptive placing, inversion, plantar grasp, and flexor withdrawal are used to increase lower extremity flexion.
 - 4. Crossed extension and eversion reflexes facilitate lower extremity extension.
 - 5. Umbilical reflex facilitates abdominal and hip flexion.
 - 6. Gallant, rooting, and neonatal positive supporting reflexes facilitate trunk extension.
 - 7. ATNR facilitates flexion and extension of all extremities; head position must be alternated to balance muscle tone.
 - 8. Suck-swallow and rooting reflexes strengthen oral-motor skills to improve oral feeding.
 - 9. Although the Moro reflex facilitates phasic and tonic muscle contractions, do not use it for treatment because it agitates infant.

Goals: Increase muscle strength; facilitate oral feeding as early as possible; facilitate developmental progress.

- E. Treatment: Pelvic rocking
 - 1. Alternation of pelvic tilt is the basis for trunk and head control.
 - 2. Gently rock the pelvis and stimulate reflexes to encourage active flexion and extension.

Goals: Improve head and trunk control; normalize muscle tone.

F. Treatment: Head control

- 1. Initially use gravity-eliminated positions with stimulation of the anterior neck musculature to encourage neck flexion.
- 2. Use gravity-eliminated positions with stroking of the posterior neck musculature and anterior pelvic tilt to encourage neck and upper trunk extension.
 - a. Be careful to ensure good upper trunk extension, not just capital extension of the neck.
 - b. Flexor tone and anterior pelvic tilt are prerequisites to development of voluntary neck extension.

Goal: Develop midline stability for better eye control, feeding, and gross motor skills.

- G. **Treatment:** Encourage visual and auditory orientation by keeping infant within 12 inches of your face. Move slowly away from infant's midline while talking.
 - 1. Limit extraneous input to allow infant to attend to the desirable stimulation.
 - 2. Bright lights and loud noises can cause infant to shut down and avoid all sensory input.

Goal: Facilitate normal acquisition of visual and auditory skills.

- H. **Treatment:** Sensory accommodation. Use stroking, rocking, and holding stimulation as tolerated to allow infant to learn to accommodate to external stimulation.
 - 1. Proprioceptive and vestibular input develops early in utero and is usually tolerated well from birth.
 - 2. Tactile and visual reflexes develop late and should be introduced after infant accommodates to more primitive stimuli.
 - 3. Auditory awareness and response are intermediate.

Goals: Lengthen periods of alertness; decrease startle responses during handling; modulate behavior.

- I. Treatment: Parent education
 - 1. Teach parents handling techniques and provide encouragement as frequently as possible.
 - 2. Give written home program as soon as parent is ready to assume responsibility for interacting with or caring for infant.
 - 3. Whenever possible, have parent provide the direct handling with consultation from you.

Goals: Encourage independent parental handling of infant to allow maximum potential to be reached; normalize environment as much as possible.

J. **Treatment:** For patients under 30 weeks or on a ventilator, provide range of motion, positioning, gentle vestibular stimulation, and consolation.

Goals: Encourage independent parental handling of infant to allow maximum potential to be reached; normalize environment as much as possible.

- III. Precautions during treatment
 - A. Observe all evaluation precautions during treatment activities.
 - B. Avoid waking infant from deep sleep for stimulation. If possible, schedule treatment during the half hour prior to feeding or when infant is irritable or poorly aligned and in need of specific handling.

Discharge

- I. Evaluation
 - A. Infant is generally not discharged from physical therapy until it is discharged from hospital.
 - B. Treatment time may be reduced after infant is successfully feeding orally, when occupational therapy begins actively treating patient, or when parents are comfortably handling infant on a daily basis.
 - C. Upon discharge from hospital, reassess infant's status and instruct parents in current home program.
- II. Follow-up plan/referral
 - A. Schedule physical therapy and occupational therapy evaluations of infant as appropriate.
 - B. Modify home program as needed.
 - C. Refer infants with special or severe problems or unstable social situations to a formal therapy program. Refer other infants to a formal therapy program if problems do not improve with home program or if new problems arise.
- III. Home program
 - A. Demonstrate the home program to parents or primary caretaker.
 - B. Observe caretaker performing activities.
 - C. Provide an illustrated home program.
 - 1. Include suggestions on positioning, carrying, and interacting with infant.
 - 2. Include specific exercises for postural abnormalities or weakness, if needed.

Patient Example

Patient is a 32-week-old female born at 30 weeks gestation. Patient presents with decreased flexor tone, extension of limbs when touched, and vital sign fluctuations during position changes.

Goal: (2 weeks)

Patient will tolerate swaddling in a flexed position for five to ten minutes without significant changes in vital signs to encourage development of normal flexor patterns.

Spe	ecial Tests					
2.5	Scarf Sign	Position:	Semireclining	191.4		
		Action:	Take infant's hand and pull it toward opposite shoulder.	across chest		
		Reaction:	Elbow does not reach midline			
			Elbow passes midline.			
			Arm encircles neck.			
	Popliteal Angle	Position:	Supine			
		Action:	Flex thigh laterally along sides of abdomen.			
			Grasp lower leg and extend k	nee.		
		Reaction:	Estimate the angle formed by asymmetry greater than 10° t	r calf and thigh, to 20° is significant.		
		D	C i			
	Heel to Ear	Position:	Supine			
		Action:	Hold legs straight and togeth	er.		
			pelvis anteriorly.			
		Reaction:	Estimate angle between heel and table. If knees do not fully extend, use an imaginary line from heel to hip in relation to table.			
	Square Corner	Position:	Any			
		Action:	Support forearm and flex wri	st.		
		Reaction:	Estimate angle between meta	acarpals and forearm.		
	Dorsiflexion	Position:	Supine			
		Action:	Hold leg straight.			
			Dorsiflex foot by applying pressure with thumb to sole of foot.			
		Reaction:	Estimate angle between dors anterior leg.	um of foot and		
	Newborn Range	Dorsiflevi	orsiflexion: 59°			
	of Motion	Plantar flavion: 26°				
		Knee exte	nsion: -15°			
		Hin exten	sion: -46°			
		TTP extens				

Gestational age	28 weeks	30 weeks	32 weeks	34 weeks	36 weeks	38 weeks	40 weeks
Posture	Completely hypotonic	Beginning of flexion of the thigh at the hip	Stronger flexion	Frog like attitude	Flexion of the 4 limbs	Hypertonic	Very hypertonic
Heel-to-ear maneuver	0	0	2	2	d	d	a
Popliteal angle			110°	100'	100°	90'	80"
Dorsiflexion angle of the foot			40-50°		20-30*		Premature reached 40 weeks
Scarf-sign	Scarf sign complete with no resistance		Scarf sign more limited		Elbow slightly passes the midline		The elbow does not reach the midline
Return to flexion of forearm	Absent (Upper limbs very hypotonic lying in extension		Absent (Flexion of forearms begins to appear when awake)	Present but weak, inhibited	Present, brisk, inhibited	Present, very strong, not inhibited	

Heel-to-ear: With the infant lying flat, the examiner lifts the legs as far as possible in an attempt to reach the ear with the feet without lifting the pelvis. The amplitude of the arc transversed by the legs is recorded (see Fig. 7-12).

Popliteal angle: The examiner flexes the infant's thighs laterally beside the abdomen, then extends the knees. The angle formed between the leg and the thigh, the popliteal angle, is recorded (see Fig. 7-13).

Dorsiflexion angle: The examiner dorsiflexes the ankle with the knee extended by applying pressure with the thumb to the sole of the foot. The angle formed by the dorsum of the foot and the anterior aspect of the leg is observed. This movement should be done twice, first slowly, then quickly. A difference of 10 degrees or more between the slow and rapid movement is abnormal. The rapid maneuver will stimulate the stretch reflex; a phasic or jerky response is suspicious, while a sustained resistance to rapid flexion is abnormal.

Scarf sign: The infant is supported in a semi-reclining position with the examiner's hand, keeping the head straight. The infant's hand is pulled across the chest toward the opposite shoulder. Three positions are described: the elbow does not reach the midline; the elbow passes the midline; or the arm encircles the neck (see Figures 7-14).

Forearm recoil: This can be elicited only when the infant is in a spontaneously flexed position. With the infant supine, the examiner extends the infant's arm by pulling on the hands, and on release of the hands, observes how quickly the forearms return to the position of flexion. If recoil is observed, the arms are again extended for 20 to 30 seconds, then released to determine if prolonged extension inhibits recoil.

(From Rudolph et al. 1987. Pediatrics, 18th ed. Norwalk, CT: Appleton and Lange, with permission.)

Gestational age	32 weeks	34 weeks	36 weeks	38 weeks	40 weeks		
Lower extremity	Brief support	Excellent straightening of legs when upright					
Trunk		+ — Transitory straightening	Good	straightening of trunk when	upright		
Neck flexors	No movement of the head	(face view) Head rolls on the shoulder	Brisk movement, head passes in the axis of trunk	Head maintained for a few seconds	Maintained in axis for more than a few seconds		
Neck extensors	Head begins to lift but falls down	(profile view) Brisk movement, head passes in the axis of trunk	Good straightening but not maintained	Head maintained for a few seconds	Maintained in axis for more than a few seconds		

Righting reaction: The examiner holds the infant in a standing position (place the hands in the axillae to support the chest). Contraction of extensor muscles of the legs and trunk, allowing the infant to support some of his other weight, is observed.

Neck flexors: The examiner grasps the infant's shoulders and pulls the infant from the supine to the sitting position. The position of the head in relation to the trunk is noted as the neck flexor muscles contract to raise the head to the vertical position.

Neck extensors: With the infant sitting and leaning froward and the head hanging down on the chest, the examiner moves the infant backward and observes the action of the neck extensors, which lift the head before the vertical position is reached.

(From Rudolph et al. 1987. Pediatrics, 18th ed. Norwalk, CT: Appleton and Lange, with permission.)
Neonatal Positioning

- I. Emergence of muscle tone
 - A. Prenatal tone develops from toe to head.
 - 1. Extension precedes flexion.
 - 2. Adduction is usually the weakest component.
 - B. Neonatal movement develops from head to toe after stabilization of the pelvis is achieved.
 - C. Balanced muscle tone precedes voluntary movement.
 - D. Feeding is dependent on good flexor tone and control.
- II. Management plan
 - A. Place in gravity-assisted positions.
 - B. Infant may need support under the chest longer than under the hips.

Primitive Reflex Activity

- I. Reflexes are muscle tone changes and stereotyped movement patterns that occur in response to specific sensory input and which form the basis for all movements.
 - A. Reflexes are eventually integrated into righting and equilibrium reactions.
 - B. Infant will be more comfortable and less irritable when in the reflexive pattern.
- II. Crossed extension reflex (emerges about 28 weeks)
 - A. Triggered by resisting flexor withdrawal, it causes the opposite leg to reflexively kick the restrained leg.
 - B. Problem. Infant repeatedly kicks at IV inserted in foot, which requires both feet to be restrained.
 - C. Management plan. Avoid restraining lower extremity in a way that stretches hamstrings or puts pressure on the sole of the foot.
- III. ATNR (emerges about 30 weeks)
 - A. Triggered by turning the head to the side in any position (prone, supine, sit), causing extremities and trunk on the skull side to flex, while those on the jaw side extend.
 - B. Problem. Unbalanced muscle tone can cause contractures that may affect the success of feeding.
 - C. Management plan
 - 1. Alternate head turning from side to side.
 - 2. Place infant in sidelying.
 - 3. Maintain head in midline.
 - 4. Turn head toward IV board on arm.
 - 5. Avoid restraining extremities in antagonistic posture (for example, extend arm on skull side).

- IV. Tonic labyrinthine reflexes (emerge about 32 weeks)
 - A. Triggered by the position of the head in space (prone, supine, vertical), it causes generalized extension when infant is in supine or with head down and generalized flexion when infant is prone. The effect is least when the head is upright.
 - B. Problem. Reinforces extensor posturing in supine, which is already the dominant pattern.
 - C. Management plan
 - 1. Place infant in prone to improve flexor tone.
 - 2. Don't attempt too much flexion when supine.
 - 3. Elevate head.
 - 4. Place infant in a seat or swing.
 - V. Neonatal body righting reflexes (emerge about 34 weeks)
 - A. Triggered by head turning, it causes the trunk to turn in the same direction as the head.
 - B. Problem. Infant fights restraints if the head is turned.
 - C. Management plan
 - 1. Maintain infant's head in midline.
 - 2. Place infant in sidelying.

Musculoskeletal Abnormalities

- I. Scaphocephalic skull
 - A. Caused by the force of gravity on the head when turned to the side.
 - B. Problem. If the occiput extends past the posterior aspect of the neck, the neck is flexed when the infant is placed in supine.
 - C. Management plan. In supine, the trunk should be lifted slightly to keep the neck in neutral position.
- II. Hip (femur and acetabulum)
 - A. Chronic posturing in the "frog-legged" position leads to retrospection of the femur, tightness of the iliotibial band, and an egg-shaped head of the femur.
 - B. Infant may not tolerate sidelying (constantly rolls backward) and later may walk with feet turned out.
- III. Tibia
 - A. The tibia externally rotates so feet are turned out and pronated.
 - B. This position is aggravated by taping the foot in plantar flexion.
- IV. Trapezius. The trapezius tightens when the shoulders are extended and elevated. The ability to bring the hands forward for reach and grasp and for support in sitting is restricted.

This page left intentionally blank.

Spina Bifida Outpatient Clinic Screening Protocol

Objectives

- I. Facilitate mastery of appropriate developmental skills.
- II. Achieve highest level of functional mobility via ambulation or wheelchair.
- III. Reduce contractures and prevent further contracture formation.
- IV. Conduct ongoing neurological and functional assessment.
- V. Conduct ongoing patient and parent education.
- VI. Assist with equipment acquisition and adjustment.
- VII. Investigate home situation and coordinate program planning with other disciplines involved.

- I. Areas to evaluate
 - A. Range of motion
 - 1. Include trunk and pelvic evaluation.
 - 2. Be aware of normal lower extremity flexion "contractures" in infants and toddlers.
 - B. Muscle strength
 - 1. Muscle activity is best assessed when infant is alert and active, even when crying or agitated.
 - 2. It is inappropriate to grade muscle strength in infants. Muscle activity may be recorded as P = Present or A = Absent.
 - 3. Voluntary motion must be differentiated from reflexive movement.
 - a. Movement in response to stimulation around the face, chest, and shoulders is likely to be voluntary.
 - b. Involuntary muscle responses are reflexive in nature and stimulus dependent.
 - c. Reflexes are the result of intact segmental spinal cord function and should not be interpreted as evidence of corticospinal tract integrity.
 - d. Stimulus-dependent flexor withdrawal is a commonly seen reflexive response.
 - 4. Increased cerebral pressure from hydrocephalus and general fatigue may influence active movement.
 - 5. Muscle functioning may not be equal bilaterally.

- C. Neurological
 - 1. Assess deep tendon reflexes and neonatal reflexes using available innervated musculature.
 - 2. Determination of the level of sensory innervation is best done when infant is in a quiet state.
 - a. Noxious stimulus can be applied, beginning distally, while looking for signs of central recognition (grimace, crying, startle responses).
 - b. Signs of cortical recognition of pain should not be confused with reflexive responses (such as flexor withdrawal).
 - 3. Also look for signs of hydrocephalus. (Refer to Precautions during Evaluation section for a list of symptoms.)
- D. Functional ability/developmental level
 - 1. Evaluate patient's involvement in therapy at home.
 - 2. Assess need for equipment modification or acquisition.
- E. Skin and soft tissue. Check for skin breakdown, ability to perform independent pressure relief, and obesity.
- F. Posture. Note asymmetries and muscle imbalance.
- G. Evaluate parents' execution and understanding of home program exercises.
- II. Precautions during evaluation
 - A. Osteoporosis is possible. Therefore, use appropriate caution with range of motion exercises.
 - B. Joint dislocation is possible, avoid simultaneous adduction and flexion of the hips.
 - C. Deformities due to prolonged positioning or muscle imbalances are possible.
 - D. Lack of sensation may prevent recognition of occult fractures, which are characterized by redness, local heat, swelling, deformity of limb, and fever.
 - E. Hydrocephalus/shunt malformation is possible. Signs and symptoms may include the following:
 - 1. Infants
 - a. Bulging fontanelle
 - b. Vomiting
 - c. Change in appetite
 - d. Sunset sign of eyes
 - e. Edema/redness/tenderness along shunt
 - f. Lethargy
 - g. Irritability
 - h. High-pitched cry
 - i. Seizures

- 2. Toddlers
 - a. Vomiting
 - b. Irritability
 - c. Headache
 - d. Lethargy
 - e. Seizures
 - f. Edema/redness/tenderness along shunt
 - g. New appearance of nystagmus
 - h. New appearance of squinting
- 3. Older child
 - a. All symptoms listed for toddlers
 - b. Personality changes
 - c. Handwriting changes
 - d. Decreased school performance
 - e. Memory changes
 - f. Decrease in sensory or motor function
- F. Hydromyelia
 - 1. The increased collection of cerebrospinal fluid in the spinal cord may cause pressure necrosis of peripheral nerve and muscle tissue, resulting in loss of muscle strength and associated scoliosis.
 - 2. Other signs of hydromyelia include progressive upper extremity weakness and hypertonus.
- G. Tethered cord
 - 1. Tethered cord usually occurs when the cord has become adhered at the level of the original surgical repair.
 - a. As the child grows, the cord stays "bound" and is unable to slide in the vertebral canal.
 - b. The inevitable stretching causes metabolic and ischemic degeneration in neural and muscle tissue, leading to a decline in muscle strength, scoliosis, or hypertonus.
 - 2. Like hydromyelia, a tethered cord requires surgical intervention. Findings that might suggest these problems (decrease in motor function, scoliosis in patient with lesion below T12) should, therefore, be reported to a physician.

- I. Frequency. Patients are scheduled as needed.
- II. Treatment techniques and goals
 - A. **Treatment:** Measure, order and modify equipment. Measure fit and assess function during clinic visits.

Goals: Provide equipment needed for maximum mobility; maintain equipment in working condition.

B. Treatment: Educate patient and parents.

Goal: Demonstrate understanding of range of motion exercises, positioning, handling, sensory precautions, developmental activities, shunt malfunction signs, and other necessary information.

- C. **Treatment:** Instruct patient and parent in exercises to improve or maintain range of motion. Appropriate range of motion exercises can be prescribed by anticipating the characteristic contractures that occur with lesions at various levels. Typical deformities include the following:
 - 1. Thoracic level
 - a. Patient may develop "frog-legged" position with hip flexion, abduction, and external rotation contractures secondary to paralysis and excessive supine positioning.
 - b. Supplement range of motion exercises with sidelying or prone positioning, gentle wrapping of the lower extremities at night, adduction straps, and splints.
 - c. Assess lumbar and pelvic range of motion and prescribe range of motion exercises as needed.
 - 2. Lumbar paralysis (L1, L2, L3)
 - a. Patient will often develop hip flexion and adduction contractures, and therefore is at risk for hip dislocation. Hip dislocations are often not reduced, and there is little evidence in the literature that hip dislocations adversely affect function.
 - b. Calcaneovarus deformity may develop if the anterior tibialis is unopposed.
 - 3. Sacral level
 - a. Patient may develop calcaneal foot if dorsiflexors are unopposed (L5 to Sl), or may develop claw toes or calcaneovalgus deformities (S1 and S2).
 - b. Toes may claw due to lack of intrinsic muscles, and cavovarus deformity may also develop (S2 and S3).

Goal: Maintain and increase range of motion.

D. **Treatment:** Prescribe a home program and refer for outpatient treatment, if needed, to promote further development.

Goal: Facilitate acquisition of gross motor milestones.

- E. **Treatment:** Progress to standing and ambulation. Although ability to walk depends on several factors, including patient and parent motivation, cognition, presence of deformity, and level of lesion, the following guidelines are generally within reason:
 - 1. Begin by positioning patient upright in a parapodium or standing frame by 12 months of age, increasing wearing tolerance to most of the day.
 - 2. A two-year-old will generally master a "swivel" gait with the use of a rolling walker.
 - 3. A three-year-old *may* begin learning a "swing-through" gait with a rolling walker, though child may still prefer a swivel gait.
 - 4. A five-year-old should have mastered a swing-through gait and be ready for crutch training. The child should also be able to lock and unlock leg braces and get in and out of them with little help. Child should begin learning transfers (including raising from floor and stairs).
 - 5. Low-level lesions may require ankle/foot orthoses or nothing at all and will, of course, progress much faster and require less intervention.
 - 6. Generally, a nonambulatory child should be fitted with a wheelchair (or travel chair if necessary) by three years of age in preparation for school.

Goal: Independent mobility (if applicable).

III. Equipment

- A. Bathing aids
- B. Wheelchairs and wheelchair cushions
- C. Transfer boards
- D. Parapodiums
- E. Splints
- F. Walkers, crutches, and braces
- G. Caster carts and scooter boards
- H. Dynamic splints

Discharge

- I. Follow-up plan/referral. Follow patient periodically via outpatient appointments. Contact home therapist if needed.
- II. Home program. Design a home program as indicated.

Patient Example

Patient is a 13-month-old female with myelomeningocele at the L5 level. Patient exhibits full range of motion and no deformities in both lower extremities. Patient is now attempting pull-to-stand transfers. Patient has previously been measured for a parapodium, which is present in clinic.

- **Goals:** (1 week) Patient's mother will demonstrate knowledge of proper fit of the parapodium and will recognize signs of skin breakdown in order to prevent pressure sores.
 - (1-2 weeks) Patient will comply with the wearing schedule for the parapodium in order to promote standing activities.



Adult Outpatient Diabetes Education Protocol

Objectives

- I. Educate patient in benefits and precautions of exercise.
- II. Develop an appropriate home program for each individual.
- III. Assist health-care team to maintain the best possible control of patient's diabetes and reduce long-term complications.
- IV. Investigate home situation and coordinate home program with other disciplines involved.

Admission/Evaluation

- I. Areas to evaluate
 - A. Cardiac/respiratory
 - 1. Pulse. Check resting radial or carotid pulse, which should be between 60 and 100 beats per minute.
 - a. Note regularity and strength of pulse.
 - b. Patients with bradycardia or tachycardia should consult their physicians before starting an exercise program.
 - 2. Blood pressure. Patients with moderate or severe hypertension (blood pressure higher than 160/95) or hypotension (blood pressure lower than 90/60) should consult their physicians.
 - B. Note blood sugar levels and ketones.
 - C. Neurological. Assess peripheral sensation, especially in hands, feet, and legs.
 - D. Note general active range of motion and muscle strength, functional level, presence of claudication, drop foot, condition of skin (especially of lower legs and feet), deformities, and gross motor coordination.
 - E. Note presence of retinopathy. Exercise can worsen an eye condition. Advise patient to check with an ophthalmologist.
- II. Precautions during evaluation: None

Exercise Education Workshop

- I. Instruct the group in the following areas.
 - A. Benefits of exercise
 - 1. Lowers blood sugar
 - 2. Prevents calcium loss from bones
 - 3. Increases circulation
 - 4. Increases muscle strength and tone
 - 5. Regulates weight gain

- 6. Lowers blood pressure and slows heart rate
- 7. Reduces stress
- 8. Keeps lungs clear
- II. Exercises
 - A. **Treatment:** Demonstrate leg exercises to be done on alternating days with aerobic exercise.
 - 1. Ankle circles
 - 2. Tiptoe exercise
 - 3. Marching
 - 4. Heel raises
 - 5. Leg sweeps
 - 6. Stairwell exercise (can be eliminated if there are no stairs at home)
 - 7. Calf stretching
 - 8. Chair exercise

Goal: Prevent circulatory disturbances in the legs and feet.

- B. Treatment: Demonstrate aerobic conditioning exercises.
 - 1. Discuss differences between aerobic, anaerobic, and stretching exercises, giving examples of each exercise.
 - 2. Emphasize that anaerobic exercises (such as push-ups, pull-ups, and weight lifting) may raise blood pressure, cause cardiac arrhythmias, and worsen an eye condition.
 - 3. Stretching can be used to lengthen ligaments, tendons, and muscles in the warm-up phase, but is not vigorous enough to lower blood glucose levels and improve cardiovascular fitness.

Goal: Improve cardiorespiratory fitness.

- 4. Aerobic exercise program
 - a. Exercise options: brisk walking, jogging, treadmill, stationary bicycle, regular bicycle, rope skipping, swimming, aerobic dancing, ice skating or roller skating, tennis, handball, squash, volleyball, hiking, or rowing.
 - b. Intensity of exercise should be 70% to 80% of maximal heart rate, which should be determined by a stress test.
 - i. Advise all class participants to consult their physicians regarding appropriate target heart rates.
 - ii. Answer questions about stress tests, if any.
 - c. Patients should exercise three to four nonconsecutive times per week, which should condition the cardiovascular system while preventing orthopedic injury from overuse.
 - d. Allow 5 to 10 minutes for warm-up, 20 to 45 minutes for aerobic exercise, and 5 to 10 minutes for cool-down.
 - e. Emphasize the importance of warm-up and cool-down.

- f. Demonstrate the six warm-up exercises.
 - i. Neck side bending
 - ii. Reach stretching
 - iii. Waist bending
 - iv. Thigh stretching
 - v. Toe touching
 - vi. Calf stretching
- 5. Allow each individual to describe the kind of exercise he/she would like to do at home.
 - a. Perform ongoing evaluation of each patient's comprehension of the educational information presented.
 - b. Modify information as indicated.
- III. Pulse taking
 - A. Instruct patients to take radial or carotid pulse by counting for 15 seconds, and then multiplying by four.
 - B. Check to make sure each individual counts accurately.
- IV. Helpful hints for the exercising insulin-dependent diabetic
 - A. The abdomen is the best site to inject insulin prior to exercise.
 - B. Blood glucose levels
 - 1. Lower than 70 mg/dl: Do not exercise.
 - 2. Between 70 and 80 mg/dl: Eat a food supplement before exercising.
 - 3. Greater than 240 mg/dl: Do not exercise.
 - 4. If ketones are present in the urine, do not exercise.
 - C. Carry a concentrated form of sugar when exercising: marshmallows, glucose tablets, hard candies, sugar packets, sugar cubes, or raisins.
 - D. Exercise one hour after a light meal and two hours after a heavy meal.
 - E. Carry an ID card with your name, telephone numbers of physicians and family to contact, illness, and type of medication used.
 - F. Know and monitor peak action time of insulin, that is, three hours after injecting regular insulin or six hours after injecting NPH insulin. Exercising at these times can cause an insulin reaction.
 - G. Do not overexercise because it may raise blood sugar.
 - H. A potential insulin reaction can last up to 48 hours.
 - V. Precautions during exercise
 - A. Instruct patients in warning signs of overexercise and related problems.
 - B. Describe warning signs of insulin reactions (hypoglycemia).
 - C. List do's and don'ts concerning exercise.

- D. Instruct patients in charting activity, pulse rate, blood glucose, activity duration, and comments/problems with exercise.
 - 1. Pulse should be taken before, during, immediately after, and five minutes after exercise.
 - 2. Blood glucose should be checked before, immediately after, 1 hour after, and 24 hours after exercise.
- VI. Conclusion
 - A. Reinforce the two types of exercises that are important to people with diabetes and how to do each type correctly.
 - B. Remind participants to check their pulses and measure blood sugar.
 - C. Remind them to consult their physicians about their target heart rates.
 - D. Leave your name and telephone number in case the participants have questions.

Short-Term Goals (by the end of class)

- I. Become independent in home exercise program.
- II. Become independent in taking pulse and checking blood sugar.
- III. Know the importance of exercise in diabetes mellitus.
- IV. Know how to exercise safely, that is, know the appropriate levels of blood sugar, pulse, blood pressure, temperature, and humidity for exercise.
- V. Recognize the warning signs of an insulin reaction and the symptoms of overexercise.

Long-Term Goals (lifelong)

- I. Decrease blood sugar levels and increase insulin sensitivity.
- II. Reduce insulin/oral hypoglycemic agent requirements.
- III. Improve circulation to extremities.
- IV. Improve cardiorespiratory fitness.
- V. Prevent or delay long-term complications of diabetes.
- VI. Prevent or decrease incidence of insulin reactions and orthopedic injuries related to exercise.
- VII. Improve self-esteem and self-confidence.
- VIII. Promote relaxation.

Patient Example

History: Patient is a 38-year-old obese female with a three-year history of Type II diabetes. In the past, blood glucose was fairly well controlled by diet alone. Recently, the patient was started on oral hypoglycemics because of elevated blood glucose levels. Patient was referred to the outpatient diabetic education program.

Goals: (following one-hour session)

- 1. Patient will take pulse independently.
- 2. Patient will understand the importance of exercise to diabetes mellitus.
- 3. Patient will understand the components of an exercise program (frequency, intensity, duration, warm-up/cool-down)
- 4. Patient will be able to determine an appropriate target heart rate independently.

 $-\psi$

Above-the-Knee Amputation Protocol

Objectives

- I. Restore highest level of function through exercise, gait training, and patient education.
- II. Investigate home situation and coordinate discharge planning with other disciplines involved.

- I. Areas to evaluate
 - A. Preoperative evaluation
 - 1. Range of motion. Test gross range of motion of all extremities, including involved hip.
 - 2. Muscle strength. Test gross muscle strength of all extremities, including involved extremity.
 - 3. Functional ability. Note functional ability, document activity level prior to hospitalization.
 - 4. Gait. Note gait if patient is not restricted to bed. Include assistive device, if applicable.
 - 5. Cardiac/Respiratory. Note respiration, especially patient's ability to deep breathe and cough, and cardiac status.
 - 6. Skin and soft tissue. Examine skin and soft tissue for presence of skin breakdown on uninvolved extremity.
 - B. Postoperative evaluation
 - 1. Range of motion. Determine specific range of motion of involved hip.
 - 2. Muscle strength. Perform specific muscle test on involved extremity. Use gross test for uninvolved extremities.
 - 3. Functional ability. Note functional ability with regard to transfers and balance.
 - 4. Gait. Observe gait pattern with assistive device.
 - 5. Skin and soft tissue. Observe condition of skin and soft tissue, stump closure, and condition of remaining foot.
 - C. Outpatient evaluation
 - 1. Range of motion. Evaluate range of motion of involved hip.
 - 2. Muscle strength. Evaluate muscle strength of all groups.
 - 3. Functional ability. Note functional ability, specifically relative to level of independence in home environment.
 - 4. Gait. Observe gait pattern with assistive device.
 - 5. Note endurance level.

- 6. Evaluate condition and shape of stump.
- 7. Assess need for stump shrinker and check patient's stump wrapping skills.
- II. Precautions during evaluation
 - A. If guillotine amputation is performed, limit upright position of patient.
 - B. If physician prefers unwrapped stump for vascular patients, use elastic bandage *only* during transfer or gait training.

- I. Frequency
 - A. See inpatients twice a day, if time permits. (Medicare patients have a limited hospital stay, so twice daily treatment is especially important.)
 - B. Outpatient physical therapy should be arranged for patients who do not achieve goals by discharge and who have transportation.
 - C. Physical therapy service may be provided by a home health agency if transportation is not available and patient is considered homebound.
- II. Treatment techniques and goals
 - A. Preoperative
 - 1. **Treatment:** Instruct patient in strengthening exercises for involved extremity. **Goal:** Familiarize patient with exercises.
 - 2. Treatment: Instruct patient in upper extremity exercise program.

Goal: Improve strength of upper extremities for functional mobility and gait.

3. Treatment: Instruct patient in deep breathing and cough techniques.

Goal: Prevent postoperative pneumonia and atelectasis.

4. **Treatment:** Instruct patient in gait with appropriate assistive device.

Goal: Promote early mobilization and achievement of independence in gait.

5. **Treatment:** Educate patient in grief process resulting from loss of extremity and in goals of therapy.

Goal: Facilitate acceptance of lifestyle changes.

- B. Postoperative
 - 1. Treatment: Review deep breathing and cough techniques.

Goal: Prevent postoperative pneumonia and atelectasis.

- 2. Treatment: Initiate exercise program.
 - a. Straight leg raise
 - b. Hip abduction and adduction
 - c. Hip extension
 - d. Prone lying

Goals: Improve strength of involved extremity and prevent contractures.

3. **Treatment:** Initiate resistive exercises of upper extremities and of uninvolved lower extremity, if weakness was noted in evaluation.

Goal: Strengthen upper extremities and uninvolved lower extremity to grade 5/5.

4. **Treatment:** Educate patient on stump care and stump wrapping, with physician approval. To ensure proper stump wrapping, sew two wraps together end-to-end to make spika wrap easier.

Goal: Promote independent stump wrapping and care.

- 5. **Treatment:** Measure and fit patient with stump shrinker, with physician approval.
 - a. To fit stump shrinker, measure length (from end of stump to groin) and width (circumference of stump at widest point).
 - b. If circumference measurements are borderline, use next smaller size to anticipate stump shrinkage.

Goal: Ensure proper shape of stump.

6. Treatment: Educate patient in stump tapping.

Goals: Desensitize end of stump; encourage patient to accept amputation.

7. Treatment: Initiate transfer training.

Goal: Perform independent transfers.

- 8. **Treatment:** Gait train, progressing from parallel bars to walker to crutches. **Goal:** Ensure safe and independent ambulation.
- 9. **Treatment:** Discuss grief process with patient and use available resources. **Goal:** Promote acceptance of condition.
- C. Outpatient
 - 1. **Treatment:** Continue strengthening upper extremities, uninvolved lower extremity, and stump, if initial treatment goals have not been achieved.

Goal: Improve strength of upper extremities, uninvolved lower extremity, and stump to grade 5/5.

2. **Treatment:** Continue patient education on stump care, stump wrapping, use of stump shrinker, and stump tapping.

Goals: Care for stump independently; prepare for prosthesis.

3. **Treatment:** Continue gait training, if initial treatment goals have not been achieved. Initiate gait training with temporary prosthesis, if applicable.

Goal: Ensure safe and independent ambulation.

4. **Treatment:** Investigate patient's financial resources, physical abilities, and medical readiness for permanent prosthesis.

Goal: Prepare patient for fitting of prosthesis.

III. Precautions during treatment

- A. If patient has had amputation secondary to vascular insufficiency, consult physician prior to wrapping stump or ordering stump shrinker.
- B. Investigate financial resources before discussing prosthetics

IV. Equipment

- A. Use assistive device for ambulation, or use a wheelchair if patient is not a candidate for gait.
- B. Patient may need a special shoe if remaining foot has skin breakdown.

Discharge

- I. Evaluation
 - A. Specifically evaluate all areas identified as problems during initial evaluation.
 - B. Evaluate patient's ability to comply with home program.
- II. Follow-up plan/referral
 - A. Arrange outpatient or home health therapy if initial treatment goals have not been met.
 - B. Refer for fitting of prosthesis.
- III. Home program. Provide written material, including information on exercises, ambulation safety, care of stump, and stump wrapping.

Patient Example

Patient is a 66-year-old male five days post left above-the-knee amputation secondary to peripheral vascular disease. Prior to admission, patient was sedentary and sat in an easy chair most of the day. Patient now presents with a 20° left hip flexor contracture and weakness in the left hip extensors, abductors, and adductors.

Goals: (1 week)

- 1. Patient will decrease left hip flexion contracture by 10°.
- 2. Patient will perform strengthening exercises independently.

Below-the-Knee Amputation Protocol

Objectives

- I. Restore highest level of function through exercise, gait training, and patient education.
- II. Investigate home situation and coordinate discharge planning with other disciplines involved.

- I. Areas to evaluate
 - A. Preoperative evaluation
 - 1. Test gross range of motion of all extremities, including involved knee and hip.
 - 2. Test gross muscle strength of all extremities, including involved extremity.
 - 3. Note functional ability, document activity level prior to hospitalization.
 - 4. Note gait if patient is not restricted to bed. Include assistive devices, if applicable.
 - 5. Cardiac/Respiratory. Note patient's ability to deep breathe and cough, and cardiac status.
 - 6. Examine skin and soft tissue for presence of ulcers on uninvolved extremity.
 - B. Postoperative evaluation
 - 1. Determine specific range of motion of involved knee and hip.
 - 2. Perform specific muscle test on involved extremity. Use gross test for upper and uninvolved lower extremities.
 - 3. Note functional ability with regard to transfers and balance.
 - 4. Observe gait pattern with assistive device.
 - 5. Observe skin and soft tissue, stump closure, and condition of remaining foot.
 - C. Outpatient evaluation
 - 1. Test range of motion of involved knee and hip.
 - 2. Test gross muscle strength of involved extremity.
 - 3. Note functional ability, especially relative to level of independence in home environment.
 - 4. Observe gait pattern with assistive device, and note endurance level.
 - 5. Evaluate condition and shape of stump.
 - 6. Assess need for stump shrinker and check patient's stump wrapping skills.
- II. Precautions during evaluation
 - A. If guillotine amputation is performed, limit upright position of patient.
 - B. If physician prefers unwrapped stump for vascular patients, use bandage only during transfer or gait training.

- I. Frequency
 - A. See inpatients twice a day, if time permits. (Medicare patients have a limited hospital stay, so twice daily treatment is especially important.)
 - B. Outpatient physical therapy should be arranged for patients who do not achieve goals by discharge.
 - C. Patients should be scheduled for prosthetic evaluation, if appropriate.
 - D. Physical therapy services may be provided by a home health agency if transportation is not available and patient is considered homebound.
- II. Treatment techniques and goals
 - A. Preoperative
 - 1. **Treatment:** Instruct patient in strengthening exercises for involved extremity. **Goal:** Familiarize patient with exercises.
 - 2. **Treatment:** Instruct patient in upper extremity exercise program. **Goal:** Improve strength of upper extremities.
 - Treatment: Instruct patient in deep breathing and cough techniques.
 Goal: Prevent postoperative pneumonia and atelectasis.
 - Treatment: Instruct patient in gait with appropriate assistive device.
 Goal: Promote early mobilization and independent gait.
 - 5. **Treatment:** Educate patient in grieving process resulting from loss of extremity and in goals of therapy.

Goal: Facilitate acceptance of lifestyle changes.

- B. Postoperative
 - 1. Treatment: Review deep breathing and cough techniques with patient.

Goal: Prevent postoperative pneumonia and atelectasis.

- 2. Treatment: Initiate exercise program.
 - a. Straight leg raise
 - b. Hip abduction and adduction
 - c. Hip extension
 - d. Knee extension
 - e. Crawling
 - f. Prone lying

Goals: Improve strength and ability to bear weight; prevent hip and knee flexion contractures in involved extremity.

3. **Treatment:** Initiate resistive exercises of upper extremities and of uninvolved lower extremity, if weakness was noted in evaluation.

Goal: Strengthen upper extremities and uninvolved lower extremity to grade 5/5.

4. **Treatment:** Educate patient on stump care and stump wrapping, with physician approval. If patient is a candidate for a prosthesis, emphasize importance of stump preparation.

Goal: Promote independent stump wrapping and care.

- 5. **Treatment:** Measure and fit patient with stump shrinker, with physician approval.
 - a. To fit stump shrinker, measure length (two inches above patella to bottom of stump) and width (circumference of stump at widest point below knee).
 - b. If circumference measurements are borderline, use next smaller size to anticipate stump shrinkage.
 - c. Smaller circumference shrinkers may be made with elastic support bandages, if patient is difficult to fit.

Goals: Ensure proper shape of stump; educate patient in use and care of stump shrinker.

6. Treatment: Educate patient in stump tapping.

Goals: Desensitize end of stump; encourage patient to accept amputation.

7. Treatment: Initiate transfer training.

Goal: Perform independent transfers.

- 8. **Treatment:** Gait train, progressing from parallel bars to walker to crutches. **Goal:** Ensure safe and independent ambulation.
- Treatment: Discuss grieving process with patient and use available resources.
 Goal: Promote acceptance of condition.
- C. Outpatient
 - 1. **Treatment:** Continue strengthening upper extremities, uninvolved lower extremity, and stump, if initial treatment goals have not been achieved.

Goal: Improve strength of upper extremities, uninvolved lower extremity, and stump to grade 5/5.

2. **Treatment:** Continue patient education on stump care, stump wrapping, use of stump shrinker, and stump tapping.

Goals: Care for stump independently; prepare for prosthesis.

3. **Treatment:** Measure and fit patient for stump shrinker, with physician approval, if not previously fitted.

Goal: Prepare for fitting of prothesis.

4. **Treatment:** Continue gait training, if initial treatment goals have not been achieved. Initiate gait training with temporary prothesis, if applicable.

Goal: Ensure safe and independent ambulation.

5. **Treatment:** Investigate patient's financial resources, physical abilities, and medical readiness for permanent prosthesis.

Goal: Prepare patient for fitting of prosthesis.

- III. Precautions during treatment
 - A. If patient has had amputation secondary to vascular insufficiency, consult physician prior to wrapping stump or ordering stump shrinker.
 - B. If patient is fitted postoperatively with rigid dressing or cast and pylon, begin isometric exercise for quadriceps and hamstrings.
 - C. Identify financial resources before discussing prosthetics.
- IV. Equipment
 - A. Use assistive device for ambulation, or use a wheelchair if the patient is not a candidate for gait.
 - B. The patient may need a special shoe if remaining foot has skin breakdown or deformities.

Discharge

- I. Evaluation
 - A. Specifically evaluate all areas identified as problems during initial evaluation.
 - B. Evaluate patient's ability to comply with home program.
- II. Follow-up plan/referral
 - A. Arrange outpatient or home health therapy if initial treatment goals have not been met.
 - B. Refer patient for prosthetic fitting, if appropriate.
- III. Home program. Provide written material, including information on exercises, ambulation safety, care of stump, and stump wrapping.

Patient Example

Patient is a 71-year-old female presenting with a left below-the-knee amputation secondary to peripheral vascular disease. She is now medically stable and ready for pre-prosthetic training. Upon evaluation, she was noted to have full range of motion in left hip and knee.

Goals: (1 week)

- 1. Patient will wrap stump with bandages independently.
- 2. Patient will position left lower extremity correctly to prevent contractures.

Burn Protocol

Objectives

- I. Minimize burn scar contracture and resultant muscle and joint abnormalities caused by prolonged immobilization.
- II. Prevent loss of strength.
- III. Maximize functional ability in patients with loss of mobility or amputation.
- IV. Promote physiological healing.
- V. Minimize hypertrophic scar formation.
- VI. Investigate home situation and coordinate discharge planning with other disciplines involved.

- I. Areas to evaluate
 - A. General impression
 - 1. Patient's age
 - 2. Date of burn
 - 3. Type of burn (thermal, chemical, or electrical)
 - 4. Associated injuries (such as fractures)
 - 5. Past medical history (limited range of motion, hypertension, rheumatoid arthritis, or other conditions)
 - 6. Preferred language
 - 7. Mental status
 - 8. Family support
 - B. Range of motion
 - 1. Note general measurements of uninvolved joints and specific measurements of involved joints.
 - 2. Note potential areas for contracture.
 - C. Muscle strength
 - 1. Specific manual muscle test should not be performed, but active motion against gravity should be noted.
 - 2. If patient has electrical burns, use specific manual muscle test to determine whether peripheral nerve damage is present.
 - D. Functional ability
 - 1. Include bed mobility and transfers.

- 2. Note equipment such as central lines, Foley catheters, nasogastric tubes, cardiac monitors.
- E. Gait
 - 1. Note the amount of manual assistance required.
 - 2. Note assistive devices used (cane, walker).
 - 3. Assess ambulated distance.
 - 4. Check for gait deviations from normal.
- F. Neurological
 - 1. Test sensation to light touch along the dermatome distribution in involved extremities, trunk, and face.
 - 2. Assess areas distal to circumferential burns, reflexes, equilibrium, and balance.
- G. Respiratory
 - 1. Note whether patient has sustained an inhalation injury.
 - 2. Is ventilation support required?
- H. Cardiac
 - 1. Note change in heart rate and blood pressure with exercise.
 - 2. Check for any premorbid conditions that may complicate treatment (myocardial infarction, pacemaker)
- I. Skin and soft tissue. Note the following:
 - 1. Percentage of total body surface area burned
 - 2. Depth of burn (including tendon exposure)
 - 3. Lacerations
 - 4. Splinted extremities
 - 5. Type of dressing
- J. Postural alignment. Evaluate patient in both sitting and standing positions, noting deviations from normal.
- II. Precautions during evaluation
 - A. Infection control
 - 1. Strict handwashing should be observed to decrease cross-infection.
 - 2. Specific isolation precautions for septic patients will be posted on the door of patient's room.
 - B. Exercise caution when moving patients with numerous invasive lines. If necessary, request assistance from the nursing staff.
 - C. Grafted extremities. Do not unwrap or exercise the grafted extremity until indicated by physician (usually four to seven days postoperative).
 - D. Gait training
 - 1. Involved lower extremities should be wrapped toe-to-groin with elastic wraps in figure-eight fashion.

- 2. Involved upper extremities should be held in a position of shoulder flexion and abduction, with the elbows flexed and the hands held high.
- E. Carefully replace splints and elastic wraps after treatment, and position patient to decrease dependent edema and prevent contracture formation.
- F. Amicon ultrafiltration system. Do not treat the extremity if present.
- G. Generally, burned patients are allowed to drink only milk and should *not* be allowed to have water, ice chips, or juice unless ordered by physician.

- I. Frequency
 - A. See patient daily or twice a day.
 - B. Provide treatment six days per week unless patient is independently performing exercise program.
- II. Treatment techniques and goals
 - A. **Treatment:** Provide passive range of motion, active-assistive range of motion, and active range of motion to all involved extremities, trunk, neck, and face.

Goals: Prevent loss of range of motion and strength.

B. Treatment: Exercise on a tilt table.

Goals: Decrease orthostatic hypotension; promote normal physiologic responses to upright position.

C. **Treatment:** Initiate gait training, taking into consideration premorbid gait and the need for assistive devices.

Goal: Attain independent ambulation on level surfaces and stairs with a normal gait.

D. **Treatment:** Treat involved ears with iontophoresis (with gentamicin). See Ion-tophoresis Protocol.

Goal: Decrease burned ear chondritis.

E. Treatment: Exercise on stationary bicycle.

Goals: Increase hip, knee, and ankle range of motion; improve cardiorespiratory endurance.

F. Treatment: Exercise on a treadmill.

Goals: Increase hip, knee, and ankle range of motion; normalize gait patterns; improve cardiorespiratory endurance.

G. **Treatment:** Ball activities may be performed individually against the wall, with a therapist, or with a group.

Goals: Increase range of motion in upper extremities and trunk; increase coordination, balance, and endurance; promote social interaction and the formation of support groups among burn patients.

H. Treatment: Exercise on Swiss ball.

Goals: Increase trunk range of motion (especially rotation); improve coordination and balance.

- III. Precautions during treatment
 - A. Heterotopic ossification
 - 1. Avoid aggressive passive range of motion of involved joints, especially the elbows.
 - 2. Note decreases in joint range of motion and the type of end feel.
 - B. Carefully monitor the patient's heart rate and blood pressure when engaging in activities designed to increase cardiorespiratory endurance.
 - C. Exposed tendons of hands or third-degree burns on dorsal surface of hands
 - 1. To protect extensor hood mechanism, perform active range of motion keeping PIP and DIP joints extended and MCP joints flexed.
 - 2. Check with physician for specific precautions until exposed areas are grafted or healed.
 - D. Observe precautions listed under Precautions during Evaluation.
- IV. Equipment
 - A. A goniometer and reflex hammer are recommended for evaluation.
 - B. Tilt table, assistive ambulation devices, treadmill, stationary bicycle, Swiss ball, beach ball, cuff weights, and wall pulleys for use during treatment
- V. General considerations
 - A. Burn patients tend to be very self-conscious about their appearance, so use discretion when treating them in the department or other areas of the hospital.
 - B. Begin treating burn patients in the department as soon as they are medically stable enough to leave the Burn Intensive Care Unit.
 - C. Encourage peer group and family support.

Discharge

- I. Evaluation
 - A. Evaluate range of motion of all affected joints.
 - B. Gait. Note whether manual assistance is required, assistive devices are used, or deviations from normal gait are present.
 - C. Neurological. Note sensory and motor deficits.
 - D. Home program. Assess patient's independence in performing home exercise program and caring for skin.
 - E. Pressure garments. Assess patient's need for elastic support bandages or compression garments. Arrange for measurements to made, if necessary.
 - F. Note remaining open areas of skin or soft tissue and areas of scar formation.
- II. Follow-up plan/referral. Arrange outpatient physical therapy treatment for patients who need continued therapy to resolve contractures, or for patients who are noncompliant with home exercise program.
- III. Home program
 - A. Give a written program of active range of motion exercises specifically for each patient's involved joints in patient's preferred language.

- B. Skin care
 - 1. Advise patient to use lanolin cream and sunscreen with SPF 15.
 - 2. Encourage patient to avoid direct sunlight by wearing a hat, long-sleeved shirt, and protective clothing.
- C. Arrange to have patient measured for elastic support garments prior to discharge. Several brands are commercially available.

Patient Example

Patient is a 26-year-old male who sustained 56% total body surface area thermal burns to ears, arms, trunk, and both lower extremities. On evaluation patient required moderate to maximum assist for all transfers and bed mobility activities. Range of motion in all affected joints was limited to 50% of normal. Patient's ears required daily iontophoresis to both ears for 20 minutes at 3.5 milliamps. Patient has remained alert and oriented and very motivated.

Goals: (7 days, depending on surgery)

- 1. Patient will increase range of motion in all affected joints by 20°.
- 2. Patient will achieve minimum assist transfers and bed mobility.
- 3. Patient will receive iontophoresis with gentamicin to both ears for 20 minutes at 3.5 milliamps to prevent chondritis.
- 4. Patient will become independent with burn exercise home program.

 $-\psi$

Iontophoresis Protocol

Objectives

- I. Promote healing of wounds, burns, or chondritis located in the ear, hand, or other areas of compromised circulation by decreasing edema, increasing circulation, and preventing growth or spread of infection.
- II. Promote absorption of antibiotics.
- III. Investigate home situation and coordinate discharge planning with other disciplines involved.

- I. Areas to evaluate
 - A. General impression
 - 1. Patient's age, sex, and date of admission
 - 2. Diagnosis and mechanism of injury
 - 3. Past medical history
 - 4. Communicative ability
 - 5. Behavior patterns
 - B. Range of motion
 - 1. Assess gross active motion.
 - 2. Burn patients need specific evaluation of involved joints. See Burn Protocol.
 - C. Strength. Assess gross strength.
 - D. Function. Note patient's ability to transfer, independence in activities of daily living, and mobility.
 - E. Gait. Assess gait pattern.
 - F. Neurological
 - 1. Note sensation to pain, temperature, and light touch.
 - 2. Note any abnormal reflexes.
 - G. Respiratory. Note past and present abnormalities.
 - H. Cardiac. Note past or present abnormalities, especially need for a cardiac monitor or pacemaker.
 - I. Skin and soft tissue
 - 1. Note wound appearance, capillary refill, edema, tenderness to touch, inflammation, pliability, and presence of exudate, as compared with uninvolved side.
 - 2. See Burn Protocol for specific evaluation of burn patients.

- J. Posture. Assess gross posture.
- II. Precautions. Follow Precautions during Treatment.

- I. Frequency
 - A. For inpatients with active infection, provide daily treatments of 25 to 40 minutes for seven days.
 - B. If iontophoresis is used prophylactically, treat inpatients for four days, then reassess for further needs.
 - C. Outpatients receive daily treatments of 40 minutes for 7 to 14 days, depending on individual needs.
- II. Treatment techniques and goals
 - A. **Treatment:** Thoroughly dampen all electrode sponges with sterile water and dampen one gauze 4" x 4" sponge per treatment.

Goal: Enhance conductivity of current with least possible interference from minerals in water.

B. **Treatment:** Apply copious amounts of medicinal cream or ointment to gauze and lay gauze on active electrode sponge.

Goal: Protect electrodes from creams and ointments.

C. **Treatment:** Prior to treatment, area to be treated should be thoroughly cleansed with alcohol. (Use sterile water for burn patients.)

Goal: Decrease current resistance.

D. **Treatment:** Adjust parameters of electrical stimulating device for proper polarity, maximum frequency, and zero output. If polarity of drug is positive, active electrode must be positive; if drug is negative, then active electrode should be negative.

Goal: Ensure proper direction of current flow.

E. **Treatment:** Test machine to ensure proper functioning and prevent surging current resistance.

Goal: Provide safe treatment to patient.

F. **Treatment:** Apply active electrode to treatment area and dispersive electrode to anterior or posterior surface of trunk, thigh, or any unburned area.

Goal: Securely apply electrodes to ensure contact with skin.

G. **Treatment:** Increase current output very slowly, until patient reports a mild tingling sensation in either electrode or until level of 3.5 milliamps is reached.

Goals: Prevent overstimulation and possible injury to treatment area.

H. Treatment: Provide patient with call bell.

Goal: Provide emergency call system.

I. Treatment: Remove electrodes after treatment and clean electrode sponges.

Goal: Prepare treatment setting for next patient.

J. Treatment: Clean area treated with gauze and cotton swabs.

Goal: Remove excess cream from treated area.

- III. Precautions during treatment
 - A. Use extreme caution when applying iontophoresis over areas with questionable sensation to pain or temperature.
 - B. Open areas of skin have low resistance to current, so burns can occur more easily in these places.
 - C. Warn patient not to change position during treatment, to avoid a change in current conduction.
 - D. Avoid use on patients with cardiac pacemakers.
 - E. Avoid use on female patients in any stage of pregnancy.
- IV. Equipment
 - A. Phoresor
 - B. Use devices for iontophoresis with the following characteristics:
 - 1. Direct current
 - 2. Clearly marked polarity of terminals
 - 3. Well-insulated wires
 - 4. Electrodes with absorbent materials covering insulate metal plates
 - C. Supplies
 - 1. Gauze 4" x 4" sponges
 - 2. Sterile water
 - 3. Cotton-tipped applicators
 - 4. Antibiotic cream
- V. General considerations
 - A. Use of clean technique is important in all phases of treatment. Treatment site may be redressed with extra gauze 4" x 4" sponge.
 - B. Direct current will likely interfere with the activity of cardiac monitor—turn alarm off, if possible.

Discharge

- I. Evaluation
 - A. Describe treatment area, including appearance, pliability, and tenderness to touch.
 - B. Note degree of healing present.
- II. Follow-up plan/referral. If patient requires additional treatment, refer to outpatient physical therapy.

Patient Example

Patient is a 36-year-old female with 13% total body surface area thermal burns to face and neck. Patient presents with second degree burns and open areas on right ear. Iontophoresis treatment ordered by physician for prevention of chondritis.

Goals: (1 week)

- 1. Patient will tolerate daily iontophoresis treatment sessions at 3.5 milliamps for 20 minutes.
- 2. Therapist will reassess need for continued iontophoresis treatments.

Rheumatoid Arthritis Protocol (Nonsurgical)

Objectives

- I. Restore patient to highest level of social and vocational function through relief of pain and maintenance of joint function.
- II. Investigate home situation and coordinate discharge planning with other disciplines involved.

- I. Areas to evaluate
 - A. Range of motion. Assess general range of motion for uninvolved joints and specific range of motion for involved joints. Include spinal and temporomandibular joint range of motion.
 - B. Manual muscle test
 - 1. Use general test for uninvolved joints and specific test for involved joints.
 - 2. This test should not be used if pain is present, especially during flare-ups.
 - C. Functional ability. Question patient concerning occupation and positions assumed during occupational activities to determine whether joint stress is occurring.
 - D. Gait
 - 1. Evaluate patient's need for assistive device, type of device needed, and its effect on the finger joints and wrist.
 - 2. Evaluate need for shoe orthotics.
 - E. Skin and soft tissue. Identify joints with active arthritis.
 - 1. An active joint is defined as one with swelling *or* one with limitations of motion and tenderness or pain on motion.
 - 2. Pain or tenderness alone are not sufficient.
 - F. Postural alignment
 - 1. Examine the feet and their effect on lower extremity alignment.
 - 2. Note presence or absence of physiological curves.
 - G. Neurological. Examine the patient for signs of Raynaud's syndrome and vasculitis with accompanying neuropathies.
 - H. Assess need for consult with other ancillary services.
- II. Precautions during evaluation
 - A. Pain may limit range of motion and alter manual muscle test results.
 - B. Medication may affect results.

- C. Following joint injections, joints are immobile for 48 hours.
- D. Obtain physician's approval before beginning aggressive therapy to cervical spine. Active or passive cervical spine extension is contraindicated in patients with advanced cervical spine disease.

- I. Frequency. Two sessions per day, one session for exercise and one session for patient education.
- II. Treatment techniques and goals
 - A. **Treatment:** Educate patient on the differences between passive range of motion, self range of motion, and active range of motion. When applicable, educate the family on proper range of motion.

Goal: Prevent joint contracture and deformity.

B. **Treatment:** Educate patient on the difference between isometric and active exercise to the lower extremity.

Goal: Ensure maximum muscle strength for joint integrity.

C. **Treatment:** Educate patient on the use of moist heat for control of joint pain and stiffness.

Goal: Relieve joint pain and stiffness.

- D. Treatment: Patient education should include the following:
 - 1. Proper posture
 - 2. Joint protection
 - 3. Energy conservation
 - 4. Proper movement patterns for sitting, lying, and working
 - 5. Information on the disease process and how the disease affects daily gross motor activities

Goal: Ensure patient has accurate knowledge of disease process and its effects on patient's mobility.

- E. **Treatment:** A maintenance conditioning program is necessary for weight control. Suggestions include:
 - 1. Swimming
 - 2. Stationary bike with properly adjusted handlebars and seat to prevent postural and knee problems
 - 3. Walking program using supportive shoes
 - Goals: Improve cardiorespiratory fitness; assist in weight control.
- III. Precautions during treatment
 - A. During flare-ups, joints require passive range of motion.
 - B. During remission, joints require active range of motion with high repetition, low or no resistance exercise.
IV. Equipment

- A. Assistive devices used in ambulation may be fitted with modified handles.
- B. Patient may need adaptive equipment, such as rolling stools or carts, in the work environment to prevent prolonged stress on joints.
- C. Patient may need other adaptive equipment, such as special shoes, to insure proper lower extremity alignment.
- D. Cervical collars may be indicated for patients with cervical spine involvement.

Discharge

- I. Evaluation
 - A. Specifically evaluate all areas identified as problems in the initial evaluation.
 - B. Evaluate patient's ability to comply with home program.
- II. Follow-up plan/referral
 - A. Coordinate plan with outpatient department to monitor home program.
 - B. A home health agency consult may be needed to help adapt patient's home.
- III. Home program. Home program should include written material on the disease process, range of motion, isometric and active exercises, the use of moist heat, and posture and joint protection in gross motor activities.

Patient Example

Patient is a 45-year-old female two weeks post an acute rheumatoid arthritis episode. She is now in the subacute stage. Mild inflammation is present in metacarpal phalangeal joints of both hands.

Goals: (1 week)

- 1. Patient will become independent with home paraffin treatment, with assistance from family members.
- 2. Family members will correctly perform gentle passive range of motion and active-assistive range of motion to patient's metacarpal phalangeal joints.

Weight Management Protocol

Objectives

- I. Design an appropriate home exercise program to maintain weight loss.
- II. Assist patient to adopt a regular exercise program designed for gradual weight loss.
- III. Coordinate treatment program with other disciplines involved, especially dietary.

Admission/Evaluation

- I. Areas to evaluate
 - A. Evaluate gross range of motion of extremities, noting tightness in hamstrings, back extensors, and gastrocnemius-soleus muscles.
 - B. Evaluate gross muscle strength of all extremities.
 - C. Assess general functional ability of patient, noting limitations in exercise positions; for example, some patients may be unable to get up from the floor.
 - D. Assess respiratory status in resting and after exercise. Note whether patient smokes.
 - E. Assess cardiac response by taking pulse and blood pressure at rest and after exercise.
 - F. Determine body composition using skin calipers, water immersion method, or bioelectrical impedance.
 - G. Assess gait, noting problems and deviations.
- II. Precautions during evaluation
 - A. Range of motion may be limited by soft tissue approximation. Document range of motion limitations for future assessment.
 - B. Consider the psychological component of obesity. Plan to spend time during the initial evaluation discussing motivation, dedication, and personal weight-loss goals of the patient.

Treatment/Goals

- I. Frequency
 - A. See inpatients twice daily. Initial endurance of patients may be low.
 - B. See outpatients three times per week for the first month, twice a week for the second month, weekly for the third month, then monthly for follow-up. Patient must augment program at home for a total of five exercise sessions per week.
- II. Treatment techniques and goals
 - A. **Treatment:** Demonstrate stretching exercises for the patient, especially stretching of heel cords, hamstrings, and low back extensors, then have patient perform exercises.

Goal: Increase flexibility of muscles to prevent injury.

B. **Treatment:** Demonstrate warm-up exercises for patient, then have patient perform exercises.

Goals: Increase blood flow to muscles in preparation for exercise; slowly stress cardiorespiratory system in preparation for exercise.

- C. Treatment: Instruct patient in pulse monitoring procedures.
 - 1. Establish target heart rate.
 - 2. Have patient perform aerobic exercise within 70% to 85% of target heart rate.

Goal: Ensure that exercise session is of an intensity adequate for weight loss.

D. **Treatment:** Instruct patient to perform 30-minute aerobic exercise program, including 5-minute warm-up and 5-minute cool-down exercises.

Goals: Improve cardiorespiratory fitness; metabolize fat; increase basic metabolic rate.

- E. **Treatment:** Discuss self-image, positive attitude, and motivation with patient. **Goal:** Improve self-image.
- F. **Treatment:** Provide patient with exercise log. Have patient complete information from clinic visits and home sessions.

Goal: Record progress and promote compliance of patient with exercise program.

- III. Precautions during treatment
 - A. Note complaints of orthopedic problems, such as joint pain, muscle pulls, and the like.
 - B. Patients with cardiorespiratory problems will require close monitoring.
 - C. Proper clothing and footwear is important to prevent injury.

IV. Equipment

- A. Body composition equipment
- B. Treadmill
- C. Stationary bicycle
- D. Exercise music

Discharge

- I. Evaluation
 - A. Re-evaluate flexibility.
 - B. Re-evaluate functional ability.
 - C. Take patient's pulse and blood pressure at rest and after exercise.
 - D. Weigh patient and repeat body composition measurement.
- II. Follow-up plan/referral. Emphasize to the patient the importance of weight maintenance, need for continued exercise, and lifestyle changes.
- III. Home program. Patient must continue exercising three times per week to maintain weight level or five times per week for further weight reduction.

 $-\psi$

Hydrotherapy Protocol

Objectives

- I. Clean wound and facilitate removal of dead and necrotic tissue.
- II. Promote wound healing.
- III. Prevent or decrease infection.
- IV. Improve circulation to involved area.

Admission/Evaluation

- I. Areas to evaluate (Whirlpool Evaluation form follows protocol.)
 - A. General impression
 - 1. Vital statistics
 - 2. Diagnosis
 - 3. Procedure performed and date of surgery
 - 4. Behavior/communication patterns of patient
 - B. Range of motion. Observe passive and active range of motion of involved and uninvolved extremities.
 - C. Strength. Evaluate gross muscle strength and note limitations.
 - D. Functional ability
 - 1. Indicate specific type of equipment and amount of assistance needed for patient transfers.
 - 2. Note status regarding activities of daily living.
 - E. Gait
 - 1. Analyze gait pattern of patient, if appropriate.
 - 2. Indicate if assistance is required for patient mobility.
 - 3. Note equipment required by patient.
 - 4. Note distance patient is able to ambulate.
 - F. Neurological. Evaluate sensory modalities (sharp/dull, light/deep touch, hot/cold) and note deficits.
 - G. Cardiac/respiratory. Note respiratory and cardiac vital signs of patient.
 - H. Skin and soft tissue
 - 1. Note appearance of tissue in involved area, including width, length, and depth of wound; vascular status; odor; tissue type (necrotic, granulation, epithelial); exudate (clear, bloody, purulent); and edema (pitting, acute, chronic/hard). Diagram wound on back of evaluation form.
 - 2. Observe general skin condition of both involved and uninvolved extremities.

- II. Precautions during evaluation
 - A. Patient may actively hemorrhage or experience swelling of tissue upon dressing removal or submersion in whirlpool.
 - B. Avoid self-contamination during evaluation and treatment by keeping hands off body and clothing.
 - 1. Wear gloves when removing dressings and dispose of gloves and dressing in appropriate contamination bags.
 - 2. Take care of hands to avoid cracks in skin and keep fingernails trimmed.
 - 3. Wear cap to protect hair and gown to protect clothing.
 - 4. Remove jewelry.
 - 5. Do not touch eyes with fingers.

Treatment/Goals

- I. Frequency. Treat patient daily or twice a day for 15 to 20 minutes, as prescribed.
- II. Treatment techniques and goals
 - A. Treatment: Hydrotherapy

Goals: Facilitate removal of dead/necrotic tissue; improve circulation to involved area; promote wound healing; provide an alternate medium for exercise; assist patient to regain and improve range of motion before and after surgery or immobilization; prevent spread of infection; facilitate granulation tissue growth in preparation for skin grafting.

- B. Most common additives include Betadine and Dakins at ratios of 1:120 (full strength), 1:240 (1/2 strength—most common), or 1:480 (1/4 strength).
- C. Apply sterile towel for protection during transport, or sterile dressings as indicated.
- III. Precautions during treatment
 - A. Patient may actively hemorrhage or experience swelling of tissue upon dressing removal or submersion in whirlpool.
 - B. Patient may suffer heat stress syndrome from prolonged treatment at high temperatures.
 - C. Secure patient's IVs and catheters to prevent contact with water.
 - D. Patient may have incontinence of bowel or bladder.
 - E. Patient may develop nausea from turbulence and heat.
 - F. Elderly patients may have decreased tolerance for heat.
 - G. Protect patient in hydrotherapy area from contamination and illness.
 - 1. Do not put equipment that is to be used during treatment on the floor (for example, filler hose, whirlpool seats, disinfectant cans, stretchers).
 - 2. To avoid dust contamination, limit shaking of linen.
 - 3. Avoid drafts.

- H. Avoid self-contamination during treatment by keeping hands off body and clothing.
 - 1. Take care of hands to avoid cracks in skin, and keep fingernails trimmed.
 - 2. Wear cap to protect hair.
 - 3. Remove jewelry.
 - 4. Do not touch eyes with fingers.
- I. Use self-protective measures when working with isolation patients.
- IV. Equipment
 - A. Whirlpool
 - B. Linen
 - C. Sterile towels
 - D. Dressing supplies
 - E. Protective garments (caps, gowns, gloves)

Discharge

- I. Evaluation
 - A. Note patient's progress toward objectives.
 - B. Note appearance of involved tissue or wound, including size, vascular status, tissue type, exudate, edema, and odor.
- II. Follow-up plan/referral
 - A. Note whether patient is scheduled for surgery (for example, skin grafting, amputation, debridement).
 - B. Refer to other services, if appropriate.
- III. Home program. Design home program to include wound care and exercises as appropriate.

Patient Example

Patient is a 45-year-old male with right foot diabetic ulcer. The ulcer has been debrided surgically, and he is receiving dressing changes by nursing staff three times a day. He presents to physical therapy for hydrotherapy with a 5 cm wide x 3 cm long x 3 cm deep wound just distal to the lateral malleolus.

Goal: (1 week) Patient will show an increase in granulation tissue in wound with no signs of infection.

 $-\psi$

Patient # Name Address tient Profile/Diagnosis Admit date Diagnosis Procedure Patient History/Comments	D.O.B.
Name Address tient Profile/Diagnosis Admit date Diagnosis Procedure Patient History/Comments	D.O.B.
Address ient Profile/Diagnosis Admit date Diagnosis Procedure Patient History/Comments	Surgery date
tient Profile/Diagnosis Admit date Diagnosis Procedure Patient History/Comments	Surgery date
tient Profile/Diagnosis Admit date Diagnosis Procedure Patient History/Comments	Surgery date
Procedure Diagnosis Procedure Patient History/Comments	Surgery date
Patient History/Comments	
Patient History/Comments	
and a bar area and	
Objective Information	
Within normal limits	
Limitations	
Manual Muscle Strength	
Within normal limits	
Limitations	
Respiratory/Cardiac Skin Soft Tissue Description	
	and the second
See diagram(s) on reverse side for details Posture Within Normal Limits Abnormalities	
 Short Term Goals (1-2 weeks) 1. Clean Wound 2. Enhance Wound Healing 3. Prevent or decrease infection 4. Other 	
4. Other	
Restore skin/soft tissue integrity to max. level	
See patient for whirlpool treatment (check one) Daily BID	
Additives	
Signature	

© 1991 by Therapy Skill Builders, a division of Communication Skill Builders, Inc. / 602-323-7500 / This page may be reproduced for administrative use. (Cat. No. 4221)



Additional Information

 $-\psi$

Guidelines for Wheelchair Evaluation and Acquisition

Objectives

- I. Determine each patient's wheelchair needs.
- II. Guide patients in the acquisition of a wheelchair.

Evaluation

- I. Funding
 - A. Private insurance may fund equipment needs.
 - 1. Request the company's name, address, and account or billing number from the patient. This information, given to the wheelchair vendor, is usually sufficient to order the wheelchair.
 - 2. In some cases (when the wheelchair is very expensive), a letter of need must be written and signed by a physician and sent to the insurance company.
 - 3. A prescription signed by a physician must accompany the letter of need.
 - B. Medicare is another possible funding service.
 - 1. Determine whether patient is covered directly or through the spouse.
 - 2. Obtain the appropriate Medicare number and coverage information, and submit it with the patient's name, address, phone number, date of birth, social security number, diagnosis, and physician's name to the wheelchair vendor. Include a prescription signed by a physician.
 - 3. Medicare will not cover some wheelchairs or specific options (see Wheelchair Categories). The wheelchair vendor may negotiate cost if the wheelchair specifications needed by the patient are not fully funded by Medicare.

II. Patient needs

- A. The age, diagnosis, and energy level of the patient largely determine the most suitable type of wheelchair.
 - 1. An active, strong patient who will use the wheelchair to a great extent (primarily spinal cord injured patients) will need a lightweight, durable wheelchair.
 - 2. Elderly or dependent patients will not need extra features; therefore, a less expensive, standard wheelchair would be appropriate.
 - 3. Wheelchair features and prices also influence selection.
- B. Patient size must be considered in the decision.
 - 1. For adults, the standard sizes available usually will suffice.
 - 2. Extra-wide or extra-narrow chairs are readily available.
 - 3. Children's wheelchairs require more precise measuring, but are available in a wider variety of sizes.

- 4. Select a chair, then choose the specifications that meet the patient's needs from the order form provided specifically for that chair.
- 5. Patients with special needs may find their choices limited by what equipment is available on specific wheelchairs. (See Wheelchair Categories for specifications.)
- C. Patient's ability to perform maintenance on the wheelchair should be carefully considered.
 - 1. Standard wheelchairs have few adjustable parts and involve very little maintenance. As the adjustability increases (standard to lightweight to sport wheelchair), the amount of necessary maintenance increases.
 - 2. When comparing models, note how adjustments are made.
 - a. Some wheelchairs tighten or adjust with clamps that may, in time, weaken and fail to hold.
 - b. Wheelchairs with adjustments that bolt through the frame are more durable.
 - c. Wheelchairs with screws that tighten with Allen wrenches or Phillips screwdrivers tend to strip over time.
 - 3. Make sure the patient is familiar with all wheelchair adjustments and maintenance procedures prior to discharge.
 - 4. Prior to discharge, provide the patient with the name and number of the wheelchair vendor in case problems develop with the chair or repairs become necessary.
- III. Family situation
 - A. It is important to consider whether or not the patient is dependent on the family for wheelchair needs.
 - B. Family finances may necessitate a less expensive, standard wheelchair.
 - C. In addition, if the family member in charge of the patient's care is elderly or weak, a lightweight chair may be the best choice.

Wheelchair Categories, Funding Sources, and Specifications

- I. Standard wheelchair
 - A. Description. A standard wheelchair is strong, durable, and stable, but will not handle curbs easily.
 - B. Funding considerations
 - 1. A standard chair is covered by private insurance and Medicare (with some limitations).
 - 2. It is the least expensive wheelchair to purchase, but if a lighter chair is preferred, the cost difference is minimal.
 - 3. Prices may vary depending on the brand of chair and specifications ordered, generally prices range from \$300 to \$600 or \$700. (Reclining or special order models carry even greater costs.)
 - C. Specifications/options
 - 1. Wheels
 - a. Spoked wheels are standard.
 - b. Magnesium wheels (without spokes) are available on some models.

- 2. Upholstery
 - a. Vinyl upholstery is standard.
 - b. Several colors are available.
- 3. Arms
 - a. Two lengths are available: desk length or full length.
 - b. Removable, height adjustable, or fixed arms must be specified on the order form.
- 4. Footrests
 - a. Removable, swing-away, or fixed footrests are available.
 - b. Wheelchairs with an elevating legrest feature may be ordered with any type of footrest.
 - c. Heel loops are also available.
- 5. Tires. Polyurethane or pneumatic (air pressure) front and rear tires are available.
- 6. Brakes
 - a. High push-to-lock brakes are standard, but may hinder rapid propulsion and injure thumbs.
 - b. These brakes may unlock when chair is pushed against a transfer surface.
- 7. Rims
 - a. Metal rims are standard.
 - b. Vertical or oblique quadriplegic rims are available, and the number of knobs may be specified.
 - c. One-arm drive is available on some models.
- 8. Special adaptations
 - a. Back height is fixed, but can be specified.
 - b. A reclining back is available on some models.
 - c. An amputee axle is available on some models.
 - d. Anti-tip levers are available on all models.
 - e. Spoke guards are not available on a standard chair.
- II. Lightweight wheelchair
 - A. Description
 - 1. A lightweight wheelchair is strong, durable, and stable. It is the same size and general shape as a standard chair, but it usually weighs 15 to 20 pounds less.
 - 2. It allows for easier handling of curbs (descent) and performance of wheelie skills. It significantly reduces the energy cost to patient.
 - B. Funding sources
 - 1. Private insurance and Medicare (with some limitations) will provide coverage for these wheelchairs.
 - 2. Prices range from \$650 to \$750.

- C. Specifications/options
 - 1. Wheels. Spoked and magnesium wheels are available. Magnesium wheels are standard.
 - 2. Vinyl or cloth upholstery is available in a variety of colors.
 - 3. Arms
 - a. Desk-length arms fixed to the chair are standard.
 - b. Removable or pivoted (swing-away) arms must be specified on the order form.
 - 4. Footrests
 - a. Removable or swing-away footrests are available, and both offer the elevating legrest feature.
 - b. Heel loops are standard.
 - 5. Tires
 - a. Polyurethane, pneumatic (air pressure), or pneumatic with solid insert front and rear tires are available.
 - b. Pneumatic tires with solid inserts improve the ride of the chair and eliminate flat tire problems.
 - 6. Brakes
 - a. High push-to-lock brakes are standard.
 - i. These locks may get in the way of rapid propulsion and injure thumbs.
 - ii. They may unlock when the chair is pushed against a transfer surface.
 - b. Pull-to-lock brakes are an option on some models.
 - 7. Rims
 - a. Metal or plastic-coated rims are available.
 - b. Vertical or oblique quadriplegic rims are available, and the number of knobs must be specified.
 - c. One-arm drive is generally not available on a lightweight chair.
 - 8. Special adaptations
 - a. Back height of chair is fixed, but may be specified on order form.
 - b. A reclining back is not available.
 - c. An amputee axle is not available.
 - d. Anti-tip levers are available.
 - e. Spoke guards are not available.
 - f. Grade aids are available.
- III. Sport wheelchair
 - A. Description
 - 1. This chair has an angled shape for increased maneuverability.
 - 2. It has a smaller turning radius and easy propulsion, and is strong, durable, and very light.

- 3. This chair allows for easy handling of curbs and is best for active patients because it has the lowest energy cost.
- B. Funding sources
 - 1. Private insurers may fund the sport chair. (Letter of need may be required.)
 - 2. When requesting funding, ask for "fully adjustable manual wheelchair," because some companies automatically reject requests for "sport wheelchairs."
 - 3. Prices range from \$1,300 to \$1,800.
- C. Specifications/options
 - 1. Wheels. Both spoked and magnesium wheels are available.
 - 2. Only cloth upholstery is available in the sport chair.
 - 3. Arms
 - a. This chair features swing-away sport arms that are full length (with and without quadriceps release).
 - b. These arms are removable and height adjustable.
 - c. Full-support or desk-type arms are available.
 - 4. Footrests
 - a. The sport chair offers fixed continuous footplate (on rigid-frame wheelchairs), swing-away, or removable footrests.
 - b. Elevating legrests are an available option.
 - c. Heel loops are standard on swing-away footrests or elevating legrests.
 - 5. Tires
 - a. Front tires may be ordered in 5-inch or 8-inch hard polyurethane for improved turning radius.
 - b. Both front and rear tires are available in polyurethane, pneumatic (air pressure), or pneumatic with solid inserts.
 - 6. Brakes
 - a. High push-to-lock brakes are standard.
 - i. These brakes may get in the way of rapid propulsion and injure thumbs.
 - ii. They may unlock when chair is pushed against a transfer surface.
 - b. High pull-to-lock brakes that eliminate these disadvantages are available.
 - c. Low-mount brakes are available and prevent accidental locking or unlocking. Low-mount brakes may not be manageable for quadriplegics who do not have good hand function.
 - 7. Rims
 - a. Both metal and plastic-coated rims are available.
 - b. Vertical or oblique guard rims may be ordered and the number of knobs specified.
 - c. One-arm drive is not available.

- 8. Special adaptations
 - a. The back height is fully adjustable on the chair.
 - b. A reclining back is not available.
 - c. An amputee axle is available on some models.
 - d. Anti-tip levers are available.
 - e. Spoke guards are available.
 - f. Grade aids are available.
- IV. Explanation of options
 - A. Rims
 - 1. Plastic-coated rims provide increased traction for patients with weak upper extremities without stressing joint integrity of the thumb. (Quadriceps knobs may stress joints.)
 - 2. Patient must have some triceps strength or very good biceps to use plastic-coated rims; otherwise quadriceps knobs are necessary.
 - B. Anti-tip levers
 - 1. These levers prevent wheelchair from tipping on inclines and may be necessary with lightweight wheelchairs for patients who are unable to bring their center of gravity far enough forward while pushing up ramps. While in place, anti-tip levers prevent independent management of curbs.
 - C. Grade aids
 - 1. Grade aids assist patients with decreased triceps function in managing inclines by preventing backward motion of the wheelchair during propulsion up a slope.
 - 2. Most models may be easily handled by quadriplegics.
 - 3. These aids require very specific adjustment for optimal utility and are ineffective if out of adjustment.

Ambulation Aids

There are many types of assistive devices that enable patients to ambulate safely. These devices vary in terms of stability, amount of support, and the coordination and balance required to use them. The most appropriate assistive device should be selected based on careful consideration of the patient's disability, balance, and coordination. The following outline includes the most common ambulation aids, indications for use, available variations, and fit, to enable you to choose the most appropriate assistive device.

- I. Axillary crutches
 - A. Indications. The patient should have at least these abilities:
 - 1. Normal upper extremity strength (5/5)
 - 2. Good balance (4/5)
 - 3. Good coordination (4/5)
 - 4. Any weight-bearing status
 - B. Variations
 - 1. Loftstrand or forearm crutches.
 - a. Available for patients with marked lower extremity weakness.
 - b. Mainly used with a swing-to, swing-through, two-point, three-point, or fourpoint gait.
 - 2. Platform crutches. A platform may be attached to a crutch for patients who have an upper extremity fracture or who are unable to bear weight through the forearm, wrist, or hand.
 - 3. The hand grips on any assistive device may vary in shape or texture to make the grasp more comfortable.
 - C. Fit
 - 1. Patient should stand with the tips of the crutches 6 inches away from the toes at a 45° angle.
 - 2. There should be two to three finger spaces between the patient's axilla and the top of the crutch.
 - 3. Adjust hand grip level with patient's ulnar styloid so that patient's elbow bends to approximately 20° to 30° when holding hand grip.

II. Standard walker

- A. Indications
 - 1. More stability is required than crutch provides.
 - 2. Fair or poorer balance and coordination (2/5 or 3/5)
 - 3. Not necessarily only for elderly patients
 - 4. Any weight-bearing status

- B. Variations
 - 1. Rolling walker. Use in the following circumstances:
 - a. When trying to facilitate a more normal gait pattern
 - b. For patients who have trouble lifting walker
 - c. For patients who can tolerate slightly less stability
 - 2. Platform walker. A platform may be attached to a walker for patients who have an upper extremity fracture or who are unable to bear weight through the forearm, wrist, or hand.
 - 3. Reciprocal walker
 - a. Helps to simulate a more normal gait.
 - b. Patient needs good coordination and cognition (or good understanding of the gait pattern).
 - 4. Hand grips. The hand grips on any assistive device may vary in shape or texture to make the grasp more comfortable.
 - C. Fit. With patient standing inside the walker, hand grip should be level with patient's ulnar styloid, so that the elbow bends 20° to 30° when the patient is holding the grip.

III. Straight cane

- A. Indications
 - 1. Only minimal support is needed.
 - 2. Minimal balance or endurance problems are present.
 - 3. Patient's status is full weight bearing or weight bearing as tolerated.
 - 4. Two canes can be used if patient is partial weight bearing.
 - 5. Place cane on side opposite involved extremity.
- B. Variations
 - 1. Hemi cane and quad cane
 - a. These canes are used with patients who need more stability than the straight cane provides yet can manage only a unilateral system.
 - b. These canes will stand alone (without falling over) if the patient releases them.
 - 2. Hand grips on any assistive device may vary in shape or texture to make the grasp more comfortable.
- C. Fit. With arm relaxed by the patient's side, the handle or grip of the cane should be level with patient's ulnar styloid so that the patient's elbow bends about 20° to 30° when gripping the cane.

Physical Therapy Protocols

Physical Therapy Protocols: Guidelines for Rehabilitation give you reproducible outlines for an initial evaluation, acute care, and equipment or follow-up concerns. A compilation of treatment protocols currently in use at the University of Texas Medical Branch, Department of Physical Therapy, these time-saving protocols cover a range of patient conditions and disabilities in neurology, orthopedics, pediatrics, and others.

Use this essential resource to establish standards of care, as a guide for developing new programs, or as an orientation tool for students and new staff. Because these materials are fully reproducible, you can adapt them as appropriate for your setting and make copies for patient files or insurance claims. Forms are included with several of the protocols to help streamline your documentation and paperwork. *Physical Therapy Protocols* is a flexible, time-saving resource that will assist you in providing the highest quality care to your patients.



a division of The Psychological Corporation

555 Academic Court San Antonio, Texas 78204-2498 1-800-228-0752 0761681280

Printed in the U.S.A.