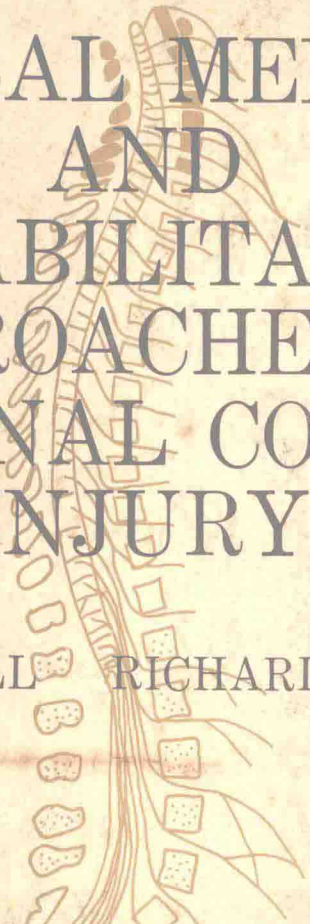
PHYSICAL MEDICINE AND REHABILITATION APPROACHES IN SPINAL CORD INJURY

JOHN G. CULL RICHARD E. HARDY



Professional personnel specializing in medicine, psychology, rehabilitation and social work will find interesting and instructive reading in this interdisciplinary text. The impressive array of contributors discuss various types of spinal cord injury, their effects, and medical and psychological treatment. The roles of a variety of specialists in relation to the rehabilitation of the patient with a spinal cord injury are also detailed.

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CHARLES C THOMAS • PUBLISHER
Springfield • Illinois • U.S.A.

Published and Distributed Throughout the World by

CHARLES C THOMAS • PUBLISHER
Bannerstone House
301-327 East Lawrence Avenue, Springfield, Illinois, U.S.A.

ISBN 0-398-03609-8

Library of Congress Catalog Card Number: 76-28528

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Printed in the United States of America
R-1

Library of Congress Cataloging in Publication Data
Main entry under title:

Physical medicine and rehabilitation approaches in spinal cord injury.

(American lecture series ; publication no. 1005)
Bibliography: p.
Includes index.
1. Spinal cord--Wounds and injuries. 2. Paralytics --Rehabilitation. I. Cull, John G. II. Hardy, Richard E. [DNLM: 1. Physical medicine. 2. Spi ıal cord injuries--Rehabilitation. WL400 C967p]
RD594.3.C84 617'.482 76-28528
ISBN 0-398-03609-8

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This book is dedicated to three of the nation's outstanding rehabilitation administrators

William T. Coppage, Virginia
Altamong Dickerson, Jr., Virginia
Bert Risley, Texas

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PREFACE

PHYSICAL medicine and rehabilitation of the spinal cord-injured individual is one of the most challenging and complex yet rewarding areas of rehabilitation. This particular area, spinal cord injury rehabilitation, is challenging since it requires input from a broader selection of professional team members of the total rehabilitation team. The purpose of this book is to detail the contribution of these various professionals and to give a broad view of the manner in which they integrate the services toward one goal that is the rehabilitation of the spinal cord-injured individual.

This has been a particularly difficult book to develop since there are contributions from so many different professional and specialty areas. Much of the difficulty lays in the fact that each area has professional terminology only some of which overlaps with the other areas; therefore, each contributor was charged with the responsibility to use as little specialized terminology as possible. We are indebted to the contributors for the concern and care they so obviously invested in their writing.

We also are indebted to many of our students who have assisted us in developing many of our concepts of rehabilitation. While the graduate students who have made these contributions are far to numerous to recognize here, we would like to single out for special recognition John B. "Benjy" Burnett, William A Crunk, Jr., Kathy F. Levinson, Stephen J. Schoen, and Scott Valentine. Others we would like to mention to whom we feel we owe a special debt of gratitude are outstanding rehabilitation practitioners and administrators with whom we have interacted in a very significant manner. They include Roy Kumpe, George Magers, Doctor Hugh B. Martin, Lewis Reves, Henry Seward, Henry Watts, and David Ziskind. We are also deeply indebted to Libby Wingfield for her major contribution

to the development of this book, for typing the manuscript, proofing, and continuing to be of good cheer.

John G. Cull
Richard E. Hardy

Stuarts Draft, Va.
1977

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PHYSICAL MEDICINE AND REHABILITATION APPROACHES IN SPINAL CORD INJURY

Chapter 1

TYPES OF SPINAL CORD INJURIES AND THEIR EFFECTS

RAYMOND W. HERRMANN AND MARK L. STANCIL

INTRODUCTION

"THOU shoulds't say concerning him; One having a dislocation in the vertebra of his neck while he is unconscious of his two legs, and his two arms, and he dribbles. An ailment *not* to be treated."

This graphic description of quadriplegia is found in what is believed to be the oldest medical textbook. The same futility in treatment continued until World War II. However, an ever-increasing number of spinal cord injuries are being treated more successfully each year.

During the 1950's and 1960's, many rehabilitation centers and departments of physical medicine and/or rehabilitation have been developed in medical schools and hospitals which treat the spinal cord-injured successfully with the end result of improvement in physical and mental health and a return to society and useful work.

Injury to the spinal cord is usually associated with injury to the spine, except in penetrating knife and bullet wounds and

disease processes. A random survey has shown that automobile accidents account for 25 percent of the cases, poliomyelitis 16 percent, multiple sclerosis 7 percent, falls 7 percent, combat injuries 6 percent, sports 6 percent, gunshots 5 percent, industrial accidents 4 percent, tumors and other disease processes comprising the remainder.

The spine is a flexible column of thirty-three bones called "vertebrae." The upper twenty-four of these are moveable or "true vertebrae." The true vertebrae are divided into seven cervical, twelve thoracic, and five lumbar. The lower nine, or "false vertebrae," are fused to form two bones, the sacrum and the coccyx.

It is within the posterior aspect of these vertebrae that the spinal cord is housed and protected as it connects the brain with the periphery and extremities, carrying sensory and motor stimuli. It is also the locus for the most reflex activity which occurs in the body.

The spinal cord is much shorter than the spinal column and in the adult its lower level lies at the disc space between the first and second lumbar vertebrae. Anterior and posterior roots spring from the sides of the cord and pass outward and downward to emerge between the vertebrae as spinal nerves. Due to the relative shortness of the spinal cord, the centers for the spinal nerves lie at a higher level than vertebra beneath which each emerges and by which each is designated. This disparity in location increases as the distance from the upper end of the cord increases.

Chirault's Rule for determining the relation of the segmental nerves to the spinous processes of the vertebrae is: "In the cervical region, add one to the number of the vertebra and this will give the segment opposite it. In the upper thoracic area add two, and from the sixth to the eleventh thoracic, add three." The twelfth thoracic spinous process and the space below it are opposite the sacral segment nerves.

Fractures of the spine are not dangerous because of the skeletal injury involved, but are dangerous to life and injurious to health because of the associated damage to the spinal cord.

More than 50 percent of all fractures of spine are of the