

PSICHIATRIA E NEUROSCIENZE

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Fondazione Santa Lucia

Handbook of Neurorehabilitation and Principles of Neurology

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Via Fra' Paolo Sarpi 7/A, 50136 Firenze – Italia

Prima edizione: maggio 2021



Stampato presso Grafica Veneta – Trebaseleghe (PD)

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Preface

According to the Global Burden of Diseases, Injuries, and Risk Factors Study, in 2019, 2.41 billion individuals worldwide had conditions that would benefit from rehabilitation, contributing to 310 million years lived with disability (YLD), and this number increased by 63% between 1990 and 2009*. The data also showed that at least one in every three people in the world needs rehabilitation at some point in the course of their illness or injury. Neurological diseases (such as cerebral palsy, stroke, traumatic brain injury, and neurodegenerative conditions) are characterized by the highest average disability weight among all the considered disorders. Consequently, people affected by such diseases are in high need of rehabilitation services.

Neurorehabilitation is a growing branch of knowledge, linking a number of different fields of medicine such as neurology, psychology, psychiatry, and other disciplines including engineering, cognitive and computer sciences. During the last decades, neurorehabilitation has developed into a medical entity largely based on the principles of evidenced-based medicine, with solid connections to basic research and clinical neurology. Today, neurorehabilitation is still changing. Treatment standards are not yet well established, technological equipment is continuously progressing and there are very few guidelines addressing contemporary neurorehabilitation from this perspective.

Santa Lucia Foundation (SLF) is a hospital specializing in neurorehabilitation located in Rome, Italy. It is a landmark institution in the field of highly specialized neurorehabilitation. In the wide spectrum of illnesses and conditions treated, neurorehabilitation therapies are especially focused on patients affected by stroke, consciousness disorders and coma, spinal cord injuries, and people suffering from degenerative diseases such as Parkinson's, Alzheimer's, and multiple sclerosis. In addition to physiotherapy and hydrokinetic treatments, rehabilitative therapies include occupational and speech therapy, orthotics, phoniatrics and pulmo-

* A. Cieza, K. Causey, K. Kamenov, S. W. Hanson, S. Chatterji, T. Vos (2020), Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019, *The Lancet*, 396(10267), 2006-17.

nary rehabilitation, and treatment of dysphagia and a wide spectrum of cognitive deficits. The neurorehabilitation treatments make use of modern technology such as brain-computer interfaces (BCI), exoskeletons, game therapy, virtual reality, and more.

In 1992, Santa Lucia Foundation achieved accreditation as an IRCCS (Istituto di Ricovero e Cura a Carattere Scientifico) from the Italian Ministry of Health, a status indicating biomedical institutions of significant national interest which drive clinical assistance in close relation to research activities. It was the result of successful research activity in the field of neuroscience and neurorehabilitation, supported since the 1980s by major investment. A tangible sign of this engagement in the field of research and development is the European Centre for Brain Research (Centro Europeo di Ricerca sul Cervello, CERC), homing many of the Foundation's laboratories in collaboration with participating researchers from different research centres and universities in Italy and globally. Significant confirmation of the Foundation's research activity is revealed by its top-quality annual scientific production, calculated according to the standard international methods of impact factor and citation indexes. The activity of Santa Lucia Foundation is therefore located on the border between experimental and clinical neuroscience with the aim of refining therapies and creating cutting-edge diagnostic and therapeutic protocols. Data from hospital activities are used to guide pre-clinical research and transfer new discoveries to patient care activities in a beneficial cycle that accelerates research and refines clinical care, all for the benefit of the patient.

This handbook describes the cutting-edge neurorehabilitation methods applied at Santa Lucia Foundation, most of which derive from basic research activities. The book will move the reader from theory to practice and will provide an understanding of the theoretical underpinnings of neurorehabilitation, as well as a clear idea about how (and why) to approach treatment decisions for individual patients. Clinical recommendations are based on a mix of established evidence and clinical experience that the handbook contributors bring to bear on their topics.

All authors are specialists in their relative fields of knowledge with wide-ranging research and clinical expertise developed in Santa Lucia Foundation and worldwide.

The handbook is divided into four sections, namely Part I, Principles of neurorehabilitation; Part II, Motor and cognitive rehabilitation; Part III, General organization and specific services; and Part IV, Clinical aspects and rehabilitation of neurological diseases.

The text stresses the fact that neurorehabilitation is an ongoing process involving multidisciplinary approaches to the treatment of patients, in which organized care is more effective than unorganized care. In this view, the merging of different professional fields facilitates the use of combined treatment techniques, thus improving outcome. In an era when the emergence of new technologies jeopardizes the integrity of medical care at individual and societal levels, it is critical that professionals involved in the management of neurological disease are provided with a broad view of how modern tools can be integrated with traditional approaches in a unique framework. This handbook is aimed at broadening their perspective such that their patients will benefit accordingly.

We hope that the handbook will provide readers with helpful insights as well as practical suggestions and the tools to successfully navigate the complex field of neurorehabilitation.

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