

RESEARCH OPPORTUNITIES

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"Research Opportunities" is a regular feature of the Journal that attempts to provide relevant and timely information regarding funding opportunities for basic and applied research in back and musculoskeletal rehabilitation. This issue contains the third and final column in a series devoted to the National Center for Medical Rehabilitation Research (NCMRR), a major new center with the National Institutes of Health (NIH) devoted to the conduct and support of research in medical rehabilitation. Previous columns provided a historical and legislative overview of the NCMRR, and described the types of grants available through the center. This issue describes the types and range of research activity reported by the center.

NATIONAL RESEARCH PLAN FOR MEDICAL REHABILITATION RESEARCH

The NIH Amendments of 1990 (P.L. 101-613) established the National Center for Medical Rehabilitation Research (NCMRR) as a unit of the National Institute of Child Health and Human Development. The mission of the NCMRR is to conduct and support a comprehensive array of research and research training that will lead to more effective rehabilitation treatment and assistive devices for persons with physical disabilities.

The 1990 amendments also formally established the National Advisory Board on Medical Rehabilitation Research. In addition to providing general guidance to the center, the board is charged with assisting the center in the development of a national research plan for medical rehabilitation research. The research plan, stipulated in the 1990 amendments, is intended to provide a structure for all medical rehabilitation research and to define precise goals for NCMRR and other agencies that fund related research activities. In February 1992, the *Draft Report and Research Plan for the National Center for Medical Rehabilitation Research* was released for public comment. Regional field hearings were held in Texas, Washington, and Maryland to allow com-

ment and reaction from consumers, members of the scientific community, and individuals representing organizations interested in research related to the medical rehabilitation of persons with disabilities.

Concurrent with the release of the *Report and Research Plan*, NCMRR issued a program announcement seeking research project, research training, fellowship, and research career award grant applications. The announcement appeared in the February 21, 1992 issue of the *NIH Guide for Grants and Contracts* (see Research Opportunities, JBM I:1 for further information on the *NIH Guide*). The scope of proposed activities contained within the program announcement was wide-ranging and congruent with the major priorities addressed in the national research plan.

NCMRR GOALS AND RESEARCH DOMAINS

Taken together, the research plan and program announcement provide the clearest view to date of the nature of the NCMRR and its potential impact on medical rehabilitation. The center appears intent on supporting both basic and clinical research directed toward restoring, replacing, or enhancing the function of children and adults with disabilities. The major research domains contained in the national research plan include: mobility; behavioral adaptation to functional limitation; whole-body system response to dysfunction; assistive technology; measurement, assessment, and epidemiology; and treatment effectiveness. The nature and scope of each of these domains is described briefly below.

Mobility

The NCMRR estimates that more than 16 million Americans have mobility limitations. Of those, more than 2 million use wheelchairs for mobility. Major mobility limitations dramatically affect an individual's independence, productivity, and ability to interact with all facets of his or her environment. In addition, the economic and human costs

of conditions that lead to mobility impairment (spinal cord injury, osteoporosis, arthritis, stroke, etc.) are enormous. These factors led the NCMRR to specify mobility-enhancement research as a major focus of the center's activity.

Research opportunities in the area of mobility enhancement include investigating the cellular, physiologic, and biomechanical mechanisms that control mobility, such as the effects of physical and pharmacological interventions on the central nervous system, sensory feedback, muscle stimulation, and biofeedback. Studies to assess the effectiveness of conservative or surgical interventions on the mobility of individuals with cerebral palsy, spina bifida, amputation, joint replacement, and traumatic brain injury also are proposed. Finally, the area of rehabilitation engineering is identified for particular focus, including both biomechanical research required to design new devices for improving mobility, and investigation of the factors that will maximize the interface between the needs of the user and the capacities of the technology.

Behavioral Adaptation to Functional Limitation

Behavioral adaptation to functional limitation refers to an individual's ability to adjust to his or her disability. This adjustment will in large part determine the individual's overall level of personal autonomy. Behavioral adaptation is affected by the individual's personality and motivation, and the environment (availability of assistive devices, rehabilitation programs, or personal assistant services). Key research opportunities in this area specified by the advisory board include the identification of strategies and factors that contribute to self-sufficiency, integration into families and communities, and employment and other usual life roles among people with disabilities. In view of the many social, psychological, and individual factors that greatly affect each individual's ability to cope with disability, specific efforts should be made to isolate these factors that directly influence an individual's cooperation with treatment approaches and with follow-up after formal rehabilitation services.

Whole-Body System Response to Dysfunction

The advisory board recognizes that disorders of one organ system frequently cause serious dysfunction in other organs or the entire organism. Important new technologies hold great promise for the pathophysiologic and impairment bases of many causes of dysfunctions. At the cellular level, recommendations include focusing on the study of mechanisms of neuronal function and recovery after injury, mechanisms of neuroplasticity, and the effects of electrical stimulation of nervous or muscle tissues, or both. At the level of impairment, studies of organ replacement through prosthetic devices, supplementing function by electrical stimulation of remaining muscles or neural pathways, and the reduction of spasticity through device implantation all are viewed as areas of tremendous research potential.

Assistive Technology

Perhaps nowhere in the NCMRR national research plan is the interdisciplinary nature of medical rehabilitation emphasized more than in the advisory board's recommendations regarding assistive technology. Potential areas for research include the application of new technologies (e.g., functional neuromuscular stimulation) in clinical settings, and development of improved assistive devices through advances in robotics, materials science, and biomechanics. Also noteworthy is the recommendation to focus on the psychosocial and environmental factors that may predict an individual's acceptance of an assistive device and the cost-effectiveness of using assistive technology to improve the independence and productivity of individuals with disabilities.

Measurement, Assessment, and Epidemiology

The advisory board recommends that the NCMRR enhance measurement and assessment technologies to truly determine the efficacy of newly developed technologies. They further recommend that national databases be established that will assist in determining priorities for research and policy development. Key areas of investigation include the development of new and precise

quantitative measures of impairment, functional limitation, disability, and societal limitation; the development of standardized measures of subjective well-being; and the development of valid measures of the effectiveness of rehabilitation interventions.

Treatment Effectiveness

The advisory board recommends that more efforts be made to assess the effectiveness of both traditional and innovative rehabilitation interventions. On a societal level, new measurement technologies must be developed to evaluate social programs designed to provide assistance to individuals with disabilities. Particular attention should be paid to longitudinal studies that assess the progress of individuals with disabilities both during and after rehabilitation. Further, a tremendous need exists for long-term studies to address the changing nature of impairments and disabilities across the life span.

SUMMARY

The NCMRR has taken only a few steps toward its ultimate goal of improved rehabilitation and treatment for individuals with disabilities. However, several trends emerge from the national research plan and other center activities that promise to have a tremendous positive impact on the lives of individuals with disabilities.

First, the national research plan acknowledges that although great strides have been made in many areas, there is much we in the field do not know. The plan's emphasis on the development of measurement and assessment tools, and the crucial need for efficacy research, indicate a sensitivity to the present state of medical rehabilitation research in many areas. The NCMRR has put forth a comprehensive plan to promote the effective validation and dissemination of newly devised rehabilitation alternatives.

Second, the national research plan emphasizes the interdisciplinary nature of medical rehabilitation research. The potential contributions of a variety of scientific disciplines are emphasized throughout all activities of the center. Physical medicine and rehabilitation, neurology, orthopedics, pediatrics, neurosurgery, nursing, physical therapy, occupational therapy, speech therapy, rehabilitation and neuropsychology, sociology, epidemiology, biomedical and biomechanical engineering, rehabilitation engineering, social work, and other health professions all are recognized as having key roles to play.

Third, the national research plan reflects the need for a complex, multidimensional medical rehabilitation research program. The plan correctly emphasizes the need for a comprehensive research plan that focuses on pathophysiological research needs while simultaneously addressing the global impact of disability on employment, independence, and community participation.