

Originally Processed With FOIA(s):

S

FOIA Number:

S

FOIA MARKER

**This is not a textual record. This is used as an
administrative marker by the George Bush Presidential
Library Staff.**

Record Group/Collection:	Donated Historical Materials
Collection/Office of Origin:	Frieden, Lex, Collection
Series:	Related Materials
Subseries:	Conferences

OA/ID Number:	52079
Folder ID Number:	52079-007

Folder Title:

"Report of the Working Group on Medical Rehabilitation Research Training, February 4-5, 1991"

Stack:

Row:

Section:

Shelf:

Position:



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
Bethesda, Maryland 20892
Building :
Room :
(301) 496-

APR 30 1991

Mr. Lex Frieden
Senior Vice President
The Institute for Rehabilitation
and Research
1333 Moursund Street
Houston, Texas 77030

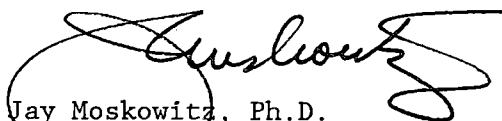
Dear Mr. Frieden:

I would like to express my appreciation to you for the time and effort you devoted to serving on the National Institutes of Health (NIH) Working Group on Medical Rehabilitation Research Training. The deliberations of the Working Group represented another critical step in NIH's initiative to outline the foundation of an expanded program in rehabilitation medicine research and research training.

The report and recommendations of the Working Group provide important guidance that will assist the newly-established National Center for Medical Rehabilitation Research within the National Institutes of Child Health and Human Development in implementing a research training program that will strengthen this important and emerging field of medical research. Your willingness to share your expertise in rehabilitation medicine and your perspective on research training issues was essential to the development of the Working Group's recommendations.

I have enclosed a copy of the final report of the Working Group and extend my thanks again for your commitment and contribution to this important endeavor.

Sincerely yours,


Jay Moskowitz, Ph.D.
Associate Director for
Science Policy and Legislation

Enclosure

*Report of the
Working Group on*

**MEDICAL
REHABILITATION
RESEARCH
TRAINING**

February 4-5, 1991

**National Institutes of Health
Bethesda, Maryland**

*Report of the
Working Group on*

**MEDICAL
REHABILITATION
RESEARCH
TRAINING**

February 4-5, 1991

**National Institutes of Health
Bethesda, Maryland**

For Administrative Use Only



**BAYLOR
COLLEGE OF
MEDICINE**

One Baylor Plaza
Texas Medical Center
Houston, Texas 77030

Division of Rehabilitation
Department of
Physical Medicine
(713) 797-5910

Address correspondence to:
1333 Moursund Avenue
Houston, Texas 77030

April 16, 1991

Jay Moskowitz, Ph.D.
Associate Director for Science Policy
and Legislation
National Institutes of Health
Shannon Bldg., Room 218
9000 Rockville Pike
Bethesda, MD 20892

Dear Doctor Moskowitz:

It is a pleasure to transmit to you the enclosed report of the Working Group on Medical Rehabilitation Research Training. The report is a product of our two-day meeting on February 4-5, 1991, and of the exchange of views that continued during the drafting process in which all members participated.

The report contains a number of recommended actions aimed at fostering the training of medical rehabilitation researchers. We view these actions as critical for enlarging research capacity directed at improving the effectiveness of medical rehabilitation practice and to understanding the causes and implications of disability.

Sincerely yours,

Marcus J. Fuhrer, Ph.D.
Professor

Vice President for Research
The Institute for Rehabilitation and Research

Working Group on Medical Rehabilitation Research Training

February 4-5, 1991

Chairman

Marcus Fuhrer, Ph.D.
Professor
Department of Physical Medicine and
Rehabilitation
Baylor College of Medicine
Vice President for Research
The Institute for Rehabilitation and
Research
Houston, TX

Members

Theodore Cole, M.D.
Chairman
Department of Physical Medicine and
Rehabilitation
University of Michigan Hospital
Ann Arbor, MI

Joel A. DeLisa, M.D.
Professor and Chairman
Department of Physical Medicine and
Rehabilitation
UMDNJ-New Jersey Medical School
Medical Director
Kessler Institute for Rehabilitation
West Orange, NJ

Leonard Diller, Ph.D.
Chief of Psychology
Rusk Institute of Rehabilitation Medicine
New York University Medical Center
New York, NY

John F. Ditunno, Jr., M.D.
Michie Professor and Chairman
Department of Rehabilitation Medicine
Jefferson Medical College of Thomas
Jefferson University
Philadelphia, PA

Thomas Findley, M.D., Ph.D.
Director of Research
Kessler Institute for Rehabilitation
Assistant Professor
Department of Physical Medicine and
Rehabilitation
UMDNJ-New Jersey Medical School
West Orange, NJ

Alfred P. Fishman, M.D.
Associate Dean for Health Science Policy
School of Medicine
University of Pennsylvania
Philadelphia, PA

Lex Frieden
Senior Vice President
The Institute for Rehabilitation and
Research
Houston, TX

Richard Materson, M.D.
Vice President and Director of Medical
Affairs
National Rehabilitation Hospital
Washington, DC

J. Edward Puzas, Ph.D.
Associate Professor of Orthopedics and
Director of Musculoskeletal Research
Department of Orthopedics
University of Rochester
Rochester, NY

Margaret Stineman, M.D.
Assistant Professor
Physical Medicine and Rehabilitation in
Medicine
University of Pennsylvania
Philadelphia, PA

Arthur Vailas, Ph.D.
Director
Biodynamics Lab
University of Wisconsin
Madison, WI

Wise Young, M.D., Ph.D.
Director
Neurosurgery Research Laboratories
New York University Medical Center
New York, NY

Table of Contents

Executive Summary	1
Introduction	5
Background Leading to the Meeting of the Working Group on Medical Rehabilitation Research Training	9
Mandate	10
Deliberations of the Working Group on Medical Rehabilitation Research Training	11
Who should be trained by the NIH for research in medical rehabilitation?	11
What should be the research training setting?	13
What is the role of interdisciplinary training for research in medical rehabilitation?	14
What steps can the NIH take to encourage greater participation by the rehabilitation medicine research community in competing for existing research and training awards?	15
What modifications of current NIH research training mechanisms are needed to meet the special requirements of research training in medical rehabilitation?	16
What training approaches should be considered to encourage early interest in the field of rehabilitation medicine by students in graduate schools and medical schools and to attract senior investigators to the field?	18
Given developments in the field of rehabilitation medicine and the number of active researchers in this field, what funding level is needed to support medical rehabilitation research training programs over the next 5 years? What high-priority training needs in rehabilitation medicine should be addressed by existing and proposed award mechanisms?	21
Working Group Recommendations	23
Conclusion	25

Appendixes	27
Appendix A: Agenda	29
Appendix B: Presenters	35
Appendix C: Selected NIH Research Training Support Mechanisms	39

Executive Summary

The National Institutes of Health (NIH) convened the meeting of the Working Group on Medical Rehabilitation Research Training on February 4 and 5, 1991, the fifth in a series of initiatives implemented by the NIH to focus on rehabilitation medicine and research. The mandate of the Working Group was to review multiple ways of enhancing research training in medical rehabilitation in order to strengthen the scientific foundation of this area of medicine and to identify specific, high-priority training needs of the medical rehabilitation research community.

During the day-and-a-half meeting, and after reviewing existing NIH training mechanisms, the Working Group's discussion was organized around the following research questions:

Who should be trained by the NIH for research in medical rehabilitation?

What should be the research training setting?

What is the role of interdisciplinary training for research in medical rehabilitation?

What steps can the NIH take to encourage greater participation by the rehabilitation medicine research community in competing for existing research and training awards?

What modifications of current NIH research training mechanisms are needed to meet the special requirements of research training in medical rehabilitation?

What training approaches should be considered to encourage early interest in the field of rehabilitation medicine by students in graduate schools and medical schools and to attract senior investigators to the field?

Given developments in the field of rehabilitation medicine and the number of active researchers in this field, what funding level is needed to support medical rehabilitation training programs over the next 5 years? What high-priority training needs in rehabilitation medicine should be addressed by existing and proposed award mechanisms?

A number of basic principles emerged from the Working Group's deliberations and helped shape its recommendations. Among these principles were the following:

- The Working Group's focus should be on the near term, particularly fiscal year 1992. Longer range planning will be informed by the comprehensive research plan that is to be developed by the National Center for Medical Rehabilitation Research (NCMRR) and by application demand in response to initial research training initiatives implemented. An analysis of manpower availability and needs relevant to medical rehabilitation research should be part of the comprehensive plan for longer term research training efforts.
- In addition to applying to the National Institute of Child Health and Human Development (NICHD) and the NCMRR, a number of recommendations of the Working Group will be relevant to the other organizational components of the NIH.
- Inclusiveness rather than restrictiveness should characterize the identification of disciplines to be targeted for training and designation of the possible research directions of trainees. Such a commitment is in accord with the multidisciplinary nature of medical rehabilitation research and reflects the complexity of the research issues involved.
- Particular emphasis should be placed on recruiting qualified individuals with physical disabilities into research training programs and onto review panels for training awards.

The Working Group's specific recommendations for training initiatives address short-term (fiscal year 1992) needs. The following four recommendations were identified for implementation by the NICHD through the NCMRR:

- That NICHD fund from six to ten T32 institutional training grants;
- That NICHD utilize the K12 mechanism to fund from four to eight research fellows and to implement a physician scientist program in cooperation with an organization representing the medical rehabilitation research community;
- That NICHD fund from four to eight fellows through the K08 clinical investigator award and the K11 physician scientist award mechanism; and
- That NICHD fund six curriculum development awards through the K07 award program.

The following six initiatives were recommended by the Working Group for NIH-wide implementation:

- That rehabilitation medicine expertise be represented on Division of Research Grants (DRG) study sections responsible for reviewing individual fellowship programs (F31 and F32 awards);
-

- That a DRG study section for medical rehabilitation research training be established;*
- That the training of disabled individuals and underrepresented groups receive emphasis;
- That 100 F31 and F32 pre- and postdoctoral individual training grants in rehabilitation medicine be awarded NIH-wide with an emphasis on postdoctoral grants;
- That each institute award two institutional training grants (T32's) in the area of medical rehabilitation research; and
- That opportunities for summer fellowships for predoctoral graduate and medical students be made available in the area of medical rehabilitation research using the T32 and T35 mechanisms.

* One member of the Working Group supported adding rehabilitation medicine investigators to existing study sections, but did not endorse the formation of a new study section before its need was assessed.

Introduction

Rehabilitation medicine is an emerging field that must mature rapidly to meet the rising demand for rehabilitation services associated with the aging of the U.S. population, the increasing average life expectancy, and the life-extending advances that have been made in acute care medicine. Significant advances made in many biomedical fields and in the social and behavioral sciences could assist in meeting this demand for increased and improved rehabilitation services. However, rehabilitation medicine has had difficulty in capitalizing on these scientific advances and in addressing some important questions because of the severe shortage of basic and clinical scientists and applied science investigators engaged in medical rehabilitation research.

As defined in the 1990 meeting of the Task Force on Medical Rehabilitation Research, rehabilitation medicine research is directed toward the understanding and management of

impairments, disabilities, and handicaps resulting from illnesses, injuries, and developmental processes that begin before birth and continue until the last stages of life. It focuses on health-related improvement in human functioning—physical, cognitive, behavioral, and social. Rehabilitation medicine research explicitly includes the application of new knowledge to the development of medical, behavioral, psychological, social, and technological interventions designed to optimize functioning after impairment, disability, or handicap.

As outlined by the Task Force, the field encompasses research in a broad range of disciplines in the biological, social, behavioral, psychological, and allied health sciences.

However, currently available research training opportunities are not sufficient to address the promise of this field of medicine nor to provide the cadre of highly qualified researchers essential to building the knowledge base needed to develop effective rehabilitation medicine interventions and services. Research training opportunities with functional improvement as a primary focus are few. Furthermore, because the number of senior investigators in rehabilitation research is also

limited, younger individuals interested in entering the field often do not have role models or mentors to guide their efforts. Finally, strategies found to be effective in cultivating the growth of emerging research disciplines, that is, strategies that attract accomplished scientists to the field and provide training opportunities for students and young investigators, have not yet been fully developed in rehabilitation medicine.

The National Institutes of Health convened the Working Group on Medical Rehabilitation Research Training on February 4 and 5, 1991, to review strategies aimed at enhancing research training in medical rehabilitation and strengthening the scientific foundation of this area of medicine. This report summarizes the Working Group's deliberations and its recommendations for implementing training initiatives specific to the field of rehabilitation medicine.

The following guiding principles emerged from the Working Group's discussions and helped shape its recommendations:

- The Working Group's focus should be on the near term, particularly fiscal year 1992. Longer range planning should be informed by the comprehensive research plan that is to be developed by the NCMRR and by application demand in response to initial research training initiatives implemented. An analysis of manpower availability and needs relevant to medical rehabilitation research should be part of the comprehensive plan for longer term research training efforts.
 - In addition to applying to the NICHD and the NCMRR, a number of recommendations of the Working Group will be relevant to the other organizational components of the NIH.
 - Inclusiveness rather than restrictiveness should characterize identification of the disciplines to be targeted for training and designation of the possible research directions of trainees. Such a commitment is in accord with the multidisciplinary nature of medical rehabilitation research and reflects the complexity of the research issues involved.
 - A variety of existing NIH research training support mechanisms should be directed to this field of research to give a broad experiential base for choosing the most effective mix of future training support mechanisms.
 - The recommended research training support mechanisms should fit the major junctures along the course of research career development, beginning in the high school years and extending into the midcareer years.
 - The appropriateness of particular settings for providing medical rehabilitation research training is influenced by the previous experience, training, and career directions of the individuals to be trained.
 - Including individuals who are knowledgeable about medical rehabilitation and its research needs on review panels for research training applications is critical for ensuring the effectiveness of the training ultimately supported.
-

- Particular emphasis should be placed on recruiting qualified individuals with physical disabilities into research training programs and onto review panels for training awards.
 - Emphasis should be placed on recruiting underrepresented groups into the field of medical rehabilitation research. Furthermore, to encourage more disabled students to enter research careers, the NIH should consider either establishing separate programs similar to its minority high school and undergraduate programs or broadening those programs to include students with disabilities.
 - Medical rehabilitation research training support mechanisms should include centers of excellence programs. At least five to ten existing centers of excellence in medical rehabilitation research can provide the appropriate mentorships as well as the requisite research resources and opportunities for potential awardees.
-

Background Leading to the Meeting of the Working Group on Medical Rehabilitation Research Training

The meeting of the Working Group on Medical Rehabilitation Research Training on February 4 and 5, 1991, was the fifth in a series of initiatives implemented by the NIH to focus on rehabilitation medicine and research. The first of these initiatives involved convening the Panel on Physical Medicine and Rehabilitation Research in November 1989. The Panel was established in response to legislative interest in medical rehabilitation research and also in response to a decision by NIH leadership to review comprehensively the needs and concerns of the medical rehabilitation research community. The Panel received testimony from the rehabilitation community and other interested parties and organizations and developed a report and recommendations for consideration by the Advisory Committee to the Director (ACD), NIH. The ACD and representatives of the National Advisory Councils of the NIH institutes reviewed the Panel's report in January 1990 and urged the expeditious development of a comprehensive plan for medical rehabilitation research.

In response to the recommendation of the ACD, the NIH convened a Task Force on Medical Rehabilitation Research in June 1990. The Task Force provided the first and most comprehensive perspective on the diverse field of medical rehabilitation research undertaken as a collaborative effort between the NIH and the rehabilitation research community. During the course of the Task Force meeting, the Panel on Basic and Clinical Research Training, one of nine Task Force panels, unanimously directed that the NIH create a subsequent ad hoc committee to review and evaluate existing training programs for rehabilitation research. The Task Force training panel expected the ad hoc committee to identify specific, high-priority training needs to be addressed with the general award mechanisms and training approaches recommended by the Task Force. It also recommended that the ad hoc committee elaborate on how needed programs should be implemented and on whether additional mechanisms and approaches would be necessary.

With the passage in November 1990 of Public Law 101-613 authorizing the NCMRR within the NICHD, the organizational focus for rehabilitation medicine at the NIH was established. As set forth in Public Law 101-613, the Center's general purpose is

the conduct and support of research and research training (including research on the development of orthotic and prosthetic devices), the dissemination of health information, and other programs with respect to the rehabilitation of individuals with physical disabilities resulting from diseases or disorders of the neurological, musculoskeletal, cardiovascular, pulmonary, or any other physiological system....

Mandate

The mandate of the Working Group on Medical Rehabilitation Research Training was to review multiple ways of enhancing research training in medical rehabilitation in order to strengthen the scientific foundation of this area of medicine. On the basis of this review, the Working Group was asked to identify specific, high-priority training needs of the medical rehabilitation research community.

Specifically, the mandate included these assignments:

- Reviewing and identifying existing NIH training and research award mechanisms that would promote increasing opportunities for single-investigator, collaborative, and interdisciplinary studies in rehabilitation medicine;
- Recommending steps the NIH can take to encourage greater participation by the rehabilitation medicine research community in competing for existing research and training awards;
- Identifying new research training programs and ways to expand existing ones in order to increase the number of new and established investigators and the diversity of research specialties represented in the field;
- Proposing approaches to support early research training of students in graduate schools and medical schools related to the field of medical rehabilitation research;
- Developing incentives to attract senior investigators in medical rehabilitation, as well as those from related disciplines and those from outside the field, to pursue research in medical rehabilitation; and
- Emphasizing high-priority training needs in the field of rehabilitation medicine to be addressed by existing and proposed award mechanisms.

The members of the Working Group on Medical Rehabilitation Research Training included representatives from basic and clinical research and the directors of several established medical rehabilitation training programs. Also among the members were representatives of the disabled community.

Deliberations of the Working Group on Medical Rehabilitation Research Training

The agenda of the Working Group meeting began with a detailed review of existing NIH training mechanisms combined with policy deliberations. The group's discussion focused on a series of questions pertaining to appropriate target groups, settings, and mechanisms for medical rehabilitation research training. The recommendations arising from these discussions reflected the variety of training issues covered and the efforts made to expand upon and add more detail to the general research training initiatives identified by the earlier Task Force on Medical Rehabilitation Research meeting in June 1990. Summaries of the group's deliberations on each question, prefaced by relevant recommendations from the Task Force report, are provided below.

RESEARCH TRAINING QUESTION #1: Who should be trained by the NIH for research in medical rehabilitation?

Synopsis of Task Force Training Recommendation: *The Task Force on Medical Rehabilitation Research recommended training opportunities for a variety of target groups, including (1) midcareer investigators in basic, clinical, or applied sciences; (2) junior faculty members in the biological sciences, engineering, and related careers; (3) junior faculty members in rehabilitation-related clinical fields; (4) young postdoctoral basic, clinical, and applied scientists; (5) graduate students in epidemiology, the biological sciences, nursing science, allied health sciences, behavioral science, social science, and engineering; and (6) medical students through summer research fellowships.*

The Working Group approached the question of who should be trained by the NIH from two perspectives. First, it considered disciplines that should be eligible for research training in rehabilitation. Examples include psychiatry, pharmacology, occupational therapy, speech pathology, prosthetics, psychology, bioengineering, and physical therapy. Next, it considered the types of researchers that would be needed to build and maintain a productive rehabilitation research program. Among the types identified were physician scientists; basic, behavioral, and social scientists; health services researchers; and investigators in engineering sciences.

Most Working Group members agreed that medical rehabilitation research training should be aimed at multiple and diverse target groups. The group anticipated that recently launched efforts in medical rehabilitation research would expand the field into new directions involving a wider spectrum of medical disciplines. Training programs targeted too narrowly at this juncture will not be flexible enough to respond to dynamic changes that will occur in rehabilitation medicine. Clinical investigators, basic scientists, health services researchers, engineers, and behavioral and social scientists were identified as important elements of a strong rehabilitation medicine research program. Furthermore, in this inclusive approach, clinical investigators would include, but not be limited to, nurses, occupational therapists, prosthetists, speech pathologists, physical therapists, psychologists, social workers, and as well as physician scientists.

Despite a clear consensus in favor of inclusiveness, the Working Group noted that some restrictions were necessary. Some members believed that programs should be specifically targeted and designed for gaps that currently exist in the field. According to this view, medical rehabilitation training programs now under development should be directed toward those individuals who can bridge basic science and rehabilitation medicine and who have demonstrated research interests in the human function and treatment outcome measures that are inherent to medical rehabilitation. For example, individuals whose work is directed toward measurable enhancement of function and clinical outcome for the disabled should be given priority in the allocation of training funds. Interest in function and outcome, according to this view, represents a more relevant selection criterion than the trainee's particular scientific or clinical discipline.

Other Working Group members believed that any scientists working in an area related to rehabilitation should be eligible for training program funds as long as their applications are judged relevant by peer reviewers representative of the field of rehabilitation. According to this view, incentives must be developed to involve investigators working in areas that do not now have obvious connections to rehabilitation because if the rehabilitation field recruits only basic scientists conducting research related to function, scientists who might someday make a contribution to rehabilitation may not enter the field.

Irrespective of an individual's discipline, whether clinical medicine, behavioral or basic sciences, allied health sciences, or engineering, the Working Group affirmed that the desired outcome of rehabilitation medicine research training programs should be the development of "independent" investigators. Research skills—such as the ability to frame the research question, to design and implement a research methodology, and to analyze and draw conclusions from research results—developed in the course of such a research training program are crucial to enhancing the research capabilities of rehabilitation medicine.

RESEARCH TRAINING QUESTION #2: What should be the research training setting?

Synopsis of Task Force Training Recommendation: *The recommendations of the Task Force on Medical Rehabilitation Research mentioned graduate schools, medical schools and medical research centers, nursing schools, and other health professional schools as potential settings for medical rehabilitation research training. The Task Force also recommended the establishment of interdisciplinary Centers of Excellence in Rehabilitation and Training, involving both basic and clinical scientists.*

In discussing the research training setting, the Working Group described the essential attributes of the setting. While noting that few existing centers now possess all these attributes, members said ideal programs should include the following characteristics:

- An established academic center with the ability to catalyze multi-dimensional scientific inquiry;
- Long-term involvement of a variety of productive mentors who have experience in relevant areas of medical rehabilitation research;
- Basic resources, including access to basic scientists, biostatisticians, and epidemiologists;
- A documented link between these resources and clinicians working in rehabilitation medicine;
- Representation of clinical, behavioral, biological, and engineering expertise on the faculty; and
- Ongoing clinical rehabilitation research projects with sufficient numbers of human subjects for clinical research.

One characteristic of appropriate rehabilitation research training settings emphasized throughout the group's discussion was clinical activity that allows personal exposure to people with disabilities. Since functional improvement is an important goal of rehabilitation research, clinical activity with patients as research subjects was seen as essential to the rehabilitation research training setting. Increased interest in rehabilitation research could also be generated, the Working Group felt, by exposing medical students and residents to disabled patients in long-term or post-acute care rehabilitation centers. Direct contact with patients in these settings would enable students and residents to gain a greater understanding of both the problems and achievements of the disabled patient and would spark a deeper interest in and commitment to rehabilitation medicine and research.

The Working Group suggested that the clinical components of the training be assessed based on the background of the trainee. For trained scientists—for example, geneticists or physiologists—assurances should be made that substantive exposure to clinical rehabilitation medicine will take place so that, in the long run, such individuals will be able to make contributions to the body of knowledge in medical rehabilitation

research. On the other hand, individuals with substantial exposure to clinical rehabilitation medicine—physiatrists, for example—could appropriately be trained in nonclinical settings.

Notwithstanding the distinct advantages of training in the clinical setting, the Working Group also recognized the recruitment advantage presented by having a greater diversity of training settings. Defining the research setting more broadly would enable rehabilitation to be more competitive in recruitment. The group suggested, however, that all programs should plan for the ultimate involvement of the trainee in a clinical setting. Communications between the clinic and the trainee in a nonclinical setting should be facilitated and documented. Close linkages could be fostered, members suggested, by including a clinician on the trainee's faculty advisory committee. This would ensure that ongoing clinical input would be provided throughout the course of the trainee's program. Working Group members also noted that when trainees leave the clinical setting for research training purposes, their decision to return to clinical rehabilitation medicine often depends on the nature of the clinical environment they experienced during training.

A question was raised about the funding eligibility of small independent training programs (in physiology, for example) which, while lacking clinical access and linkages to a rehabilitation medicine department, can be expected to have a substantial impact on rehabilitation research. Members agreed that such a program should not be excluded as a potential training site. However, they also recommended that the program be required to demonstrate to reviewers its relevancy to medical rehabilitation research and, optimally, provide exposure to clinical issues.

Senior NIH officials posed another question about whether a biomedical engineering research training program could be freestanding. Members replied that autonomous bioengineering programs would not be broad enough to warrant funding. To be eligible for funding, the group said, bioengineering training programs would need to be associated with clinical settings and provide training in clinical issues.

RESEARCH TRAINING QUESTION #3: What is the role of interdisciplinary training for research in medical rehabilitation?

The Task Force made no specific recommendation regarding the role of interdisciplinary training in medical rehabilitation. In its discussion of this question, the Working Group began by broadly defining the term "interdisciplinary" to include a range of clinical medicine disciplines as well as basic science fields. The group's exploration of this issue emphasized the role of interdisciplinary training in providing opportunities for cross-fertilization, and its discussion is thus relevant to the previous question regarding the research training setting.

While acknowledging that highly relevant rehabilitation research can be conducted in isolated laboratories, the Working Group suggested that training grants should aim at programs that include or are in direct

contact with a broad base of disciplines. An interdisciplinary setting allows trainees to focus their own research in a specific area—such as pulmonary problems or issues related to occupational or physical therapy—and in the course of their activities be exposed to rehabilitation problems in other areas. In this way, opportunities for cross-fertilization are maximized.

The Working Group determined that the need to maximize opportunities for cross-fertilization with the basic sciences and other relevant disciplines was of such importance that solely freestanding programs and programs based in non-interdisciplinary settings would not be appropriate targets of training funds. It was suggested that the study section reviewing the proposals should be responsible for determining whether the mix of available disciplines proposed by an applicant is sufficiently broad.

The role of interdisciplinary training was viewed as particularly important at present because of the need to expedite the development of the research capacity of medical rehabilitation. Once this capacity has been established and more resources are available, a longer term goal should involve the development of more specialized programs.

RESEARCH TRAINING QUESTION #4: What steps can the NIH take to encourage greater participation by the rehabilitation medicine research community in competing for existing research and training awards?

Synopsis of Task Force Training Recommendation: *Strategies recommended by the Task Force on Medical Rehabilitation Research to increase the use of existing NIH research and training awards included revising award announcements to encourage rehabilitation specialists to compete for grants; ensuring that award announcements are disseminated to medical schools and university departments with research interests relevant to rehabilitation; and directing institutes and centers with professed rehabilitation-related interests to include rehabilitation research as an explicit program objective. The Task Force also recommended strategies to ensure that applications for rehabilitation medicine research and training receive adequate review at the NIH, including the formation of a separate rehabilitation research study section, incorporation of individuals with rehabilitation expertise into existing study sections, and representation of the rehabilitation research community on the Advisory Councils of the NIH institutes and centers.*

In discussing mechanisms to encourage the rehabilitation medicine community's participation in existing NIH training programs, the Working Group focused on the membership of the peer review system. The group suggested that the NIH inaugurate a policy to ensure that the peer review process include participants knowledgeable about rehabilitation medicine and rehabilitation research. This policy would increase and encourage participation by the current rehabilitation research community. Group members also agreed that inclusion of qualified

individuals with disabilities on study sections would heighten the sensibilities of study section members to rehabilitation research issues.

During the ensuing discussion of the peer review process, senior NICHD officials advised the Working Group that the NICHD plans to establish a special review committee within the newly authorized National Center for Medical Rehabilitation Research. This committee would review applications for institutional training grants in the rehabilitation field and would be comparable to committees that have been established in other NICHD center programs (for mental retardation, maternal and child health, and population research), each of which includes representatives of both the behavioral sciences and the biomedical sciences.

With respect to the issue of a separate study section for rehabilitation research training proposals, the Working Group was advised that NICHD intends to make such a request to the DRG. However, NICHD officials cautioned that longstanding DRG policy requires that the creation of separate study sections be justified by need as reflected in the number of relevant proposals received.

Another strategy suggested by the Working Group to increase research training in rehabilitation was for institutional training grant applicants to demonstrate a connection between research training and academic careers in medical rehabilitation research. Senior NICHD officials pointed to existing research career development programs that could be adapted to meet the needs of the rehabilitation medicine community. One model, the Pediatric Scientist Training Program, was developed by the Association of Medical School Pediatric Department Chairmen and funded collaboratively by the NIH (through the K12 career development mechanism) and a consortium of private foundations. The pediatric program supports postresidency training in the basic sciences for young faculty members whose posttraining goals include academic research as well as an ongoing involvement in clinical endeavors. Each applicant's department is required to guarantee the applicant a junior faculty position for 3 years and dedicated time for research upon completion of training. While this mechanism works well for relatively large departments such as pediatrics or obstetrics-gynecology, members noted that it is not clear that many physical medicine and rehabilitation departments would be able to guarantee 3 protected years.

The Working Group was advised that development of a training program for physician scientists based on the pediatric model would be considered at an upcoming series of meetings of medical rehabilitation academic and research organizations. If feasible, an application for funding of the program will be submitted to the NIH by June 1991.

RESEARCH TRAINING QUESTION #5: What modifications of current NIH research training mechanisms are needed to meet the special requirements of research training in medical rehabilitation?

Synopsis of Task Force Training Recommendation: *The Task Force Panel on Medical Rehabilitation Research recommended that an award be created to support development of curricula for training programs in rehabilitation medicine research.*

The Working Group's discussion of this question focused on the possibility of modifying NIH's K07 career development program. Designed to encourage the development of new medical school curricula in understaffed disciplines, the goal of the award is to increase the number of researchers in targeted fields by enhancing curriculum quality and the approach used in teaching the discipline in medical school.

Senior NIH officials provided an example of how the K07 program was previously employed to encourage a greater emphasis on pulmonary disease in the medical school curriculum. Young faculty members who received these awards were provided incentives and support mechanisms to concentrate on curriculum development. In turn, they served as liaisons to pulmonary programs at other medical schools. They also met as a group to discuss common issues and resolve shared problems. This cohesive educational effort resulted in the development of an important new pulmonary curriculum that became a resource for schools across the Nation and in an increase in the number of research-oriented pulmonary specialists. It was judged a success to the extent that medical students' test scores in pulmonary diseases improved and the number of students going on to specialize in pulmonary medicine grew. However, the program's evaluation also revealed that award recipients had not been promoted at the same rate as their colleagues in research and clinical tracks.

During the subsequent discussion, Working Group members supported using the K07 award as a way of encouraging medical schools to increase their efforts in research and training in rehabilitation medicine and agreed that its purpose should be the development of a curriculum that will attract young medical students into rehabilitation. Discussion explored using the award to develop a universal research training curriculum for medical rehabilitation. The group concluded that such a goal was inappropriate; training curricula would necessarily vary from institution to institution, depending on research focus and other institutional characteristics. The Working Group also suggested that the rehabilitation community seek funding from the Robert Wood Johnson Foundation for support of a rehabilitation research training program modeled on the Foundation's Clinical Scholars Program.

The Working Group also considered the most appropriate target of K07 awards. Some members suggested that rehabilitation department chairmen are the best candidates for K07 awards because of their knowledge of operational issues and their political influence within medical schools. Other members maintained that, although less senior faculty members may lack similar breadth of experience and administrative influence, they possess other important attributes. For example, they tend to be innovative, have fewer administrative and other competing

obligations, and have more time to devote to curriculum development. The Working Group agreed that the program's eligibility criteria should require assurances from the supporting academic institution that a grant recipient's future advancement potential will not be adversely affected by his or her involvement in curricular activities.

RESEARCH TRAINING QUESTION #6: What training approaches should be considered to encourage early interest in the field of rehabilitation medicine by students in graduate schools and medical schools and to attract senior investigators to the field?

Synopsis of Task Force Training Recommendation: *The Task Force recommended that individual and institutional awards be established to support predoctoral and postdoctoral basic and clinical research training in graduate schools and medical schools. The Task Force also recommended funding of young academic investigator awards in basic and applied rehabilitation medicine research to attract junior faculty members in the biological sciences, engineering, and related careers and funding of young clinical investigator awards in clinical rehabilitation medicine research to train young faculty members in clinical fields. To attract established clinical, basic, and applied investigators into rehabilitation medicine, the Task Force recommended that midcareer rehabilitation research development awards be funded.*

The Working Group affirmed the importance of exposing students and disabled individuals to the field of rehabilitation medicine and recommended that the T32 institutional training grants program be used to support summer predoctoral fellowships to target these potential recruits. In keeping with rehabilitation medicine's broad disciplinary emphasis, the Working Group suggested that students from a wide range of disciplines and with diverse clinical interests, including occupational therapists, physical therapists, sociologists, bioengineers, and nurses, as well as medical students, be made eligible for fellowship experiences. It was suggested that a predoctoral fellowship program might also have a corollary influence on senior investigators in rehabilitation-related disciplines, who would see the availability of student research assistants as an incentive for their involvement in rehabilitation research.

The Working Group also suggested that funding approaches at the doctoral and predoctoral levels should be flexible. For example, students who are enrolled in one institution but conduct their doctoral research at another should be able to receive institutional training support from the latter institution as well as support from the degree-granting home institution for coursework taken there. Similar flexibility and interdisciplinary involvement were recommended for students with intradepartmental arrangements at one institution.

With respect to the importance of recruiting more disabled individuals into rehabilitation research, some Working Group members anticipated that the 1990 Americans with Disabilities Act will have a significant impact on medical school enrollment of students with

disabilities. The group suggested that institutions applying for training grant funds in rehabilitation research should be required to document that efforts were made to attract underrepresented groups, including disabled students. Not only might the opportunity to work with disabled peers stimulate interest in rehabilitation among predoctoral students, but more disabled students would be attracted to pursuing careers in rehabilitation medicine research.

Working Group members suggested that individual fellowship programs should be emphasized. For pragmatic reasons, they also recommended that priority be given to training at the postdoctoral level because postdoctoral programs produce competitive independent investigators more quickly than predoctoral programs. While the group agreed that emphasis should be placed at the postdoctoral level, particularly in the initial phase of the program, it stated that funds should be allocated at this time for predoctoral training as well.

The group also discussed physician scientist training mechanisms. The fellowship training programs (T32 and F32) were reviewed as possible instruments for producing more clinician researchers. After giving some thought to the shorter training support provided through these programs (typically 3 years), the Working Group decided that NIH's career development awards (K11 and K12) were preferable mechanisms for clinicians. These programs are designed explicitly for clinicians and automatically provide 5 years of support and higher stipends.

The Working Group identified the Clinical Investigator Award (K08) as another important mechanism in yielding independent investigators. The K08 award is designed to provide the opportunity for promising clinically trained individuals to develop into independent biomedical investigators. It enables candidates to investigate a well-defined problem under a sponsor or sponsors competent to provide guidance in the chosen area of research.

These awards seem particularly appropriate as a means of supporting research training in medical rehabilitation for the following reasons:

- They are aimed explicitly at individuals with clinical backgrounds who, following research training, are committed to substantial involvement in research.
- It is possible to supplement the NIH salary (a maximum of \$50,000 per annum) so that the individual's total income is consistent with the grantee institution's salary scale for persons of comparable status.
- Additional funds (typically \$10,000) are available to cover research-related expenses.

The K08 awards are aimed principally at individuals with M.D. credentials, but one of the stated exceptions—for an individual with a Ph.D. unrelated to the biomedical and behavioral sciences—is particularly relevant to the medical rehabilitation field. That exception would seem to apply to individuals in rehabilitation-related disciplines, such as

physical therapy or nursing, whose Ph.D. degrees are oriented toward education or administration rather than research.

To involve midcareer individuals in medical rehabilitation research, the Working Group considered both established researchers in other disciplines and established rehabilitation clinicians who lack research training. Senior investigators in other disciplines are often exposed to rehabilitation medicine through collaborative activities with rehabilitation researchers. Such collaborative opportunities have become more limited because of the significantly increased demands placed on academic departments. The Working Group suggested that such individuals be encouraged to participate as mentors in institutional training programs funded by T32 grants. They can also be involved in exploratory research programs similar to those created by the National Center for Nursing Research. These strategies would provide senior investigators the opportunity to discover rehabilitation research. Noting the growing interest in rehabilitation medicine in the specialties of neurology and orthopedics, the group suggested that investigators in those fields are likely to be good candidates for such efforts.

Strategies for exposing midcareer clinicians in rehabilitation medicine to research training were also considered. The NIH F33 award provides opportunities for experienced scientists to change the direction of their research careers or to acquire new research skills. While viewing it as a potentially useful mechanism, the Working Group noted that when applied to clinicians the F33 award has several drawbacks. First, it is geared toward the established researcher, so many clinicians may not compete successfully. Second, the size of the F33 award normally requires investigators on sabbaticals to secure additional support. Finally, the length of the training provided under the award (1 year) is not likely to allow sufficient exposure to research training for many clinicians. Even in such areas as biostatistics and epidemiology where a 1-year program might be sufficient, the Working Group noted, the competitive nature of securing program funds will place clinicians at a disadvantage.

The Working Group concluded that the F33 award might be appropriate for providing certain established rehabilitation medicine clinicians with training in areas such as biostatistics and epidemiology, but not training in the basic sciences. In addition, the F33 was seen as useful in supporting scientists from other disciplines who were willing and able to make the 1-year, 50 percent time commitment that the award requires. For scientists from other disciplines for whom the F33 was inappropriate, exposure to rehabilitation medicine might best be accomplished through networking or collaboration facilitated by the presence of training programs. The group also suggested that established scientists could apply for both an F33 and an individual investigator award (R01). The F33 funds would be awarded only if the investigator did not receive R01 funding.

RESEARCH TRAINING QUESTION #7: Given developments in the field of rehabilitation medicine and the number of active researchers in this field, what funding level is needed to support medical rehabilitation research training programs over the next 5 years? What high-priority training needs in rehabilitation medicine should be addressed by existing and proposed award mechanisms?

The Working Group stated that the determination and analysis of manpower needs relative to rehabilitation research should be part of a comprehensive long-term research training plan developed by the National Center for Medical Rehabilitation Research. The group emphasized that its decisions regarding funding levels and priorities were implicit in its recommendations about the types of training initiatives and numbers of awards that should be implemented by the NICHD and by other components of the NIH. Specific Working Group recommendations on training initiatives are found in the next chapter of this report.

Working Group Recommendations

The Working Group recommended a number of training initiatives aimed at increasing research training capacity in rehabilitation medicine. Recognizing that a long-range research training plan will be formulated by the National Center for Medical Rehabilitation Research, the Working Group focused on short-term (fiscal year 1992) needs. Its recommendations are divided into (a) initiatives to be implemented by NICHD through the National Center for Medical Rehabilitation Research and (b) initiatives that cut across all organizational components of the NIH.

The Working Group's recommendations for initiatives to be implemented by NICHD and the rationale for each of these initiatives follow. Because of the relatively small aggregate investment involved in implementing these recommendations, the Working Group did not explicitly prioritize the initiatives. In terms of the numbers of training grants recommended in each category, the group noted that the actual level funded would be contingent, in the final analysis, upon the quality and number of applications received.

- **That NICHD fund from six to ten T32 institutional training grants.**

The recommendation that NICHD fund from six to ten institutional training grants was based on the Working Group's estimate of the number of institutions that can currently attract from two to eight trainees at the pre- and postdoctoral levels and provide a suitable training environment for them. It was noted that although approximately ten organizations recently applied to the National Institute of Disability and Rehabilitation Research for research training support, funding limitations allow only four programs to receive grants. The remaining institutions, and perhaps others as well, can be expected to submit applications for the NICHD funds. This recommendation was also based on the understanding that institutional training grants range in cost from \$35,000 to \$250,000 and that the average starting grant (involving approximately two predoctoral and three postdoctoral trainees) would be between \$100,000 and \$120,000.

- **That NICHD, utilizing the K12 mechanism, fund from four to eight fellows and implement a physician scientist program in cooperation with an organization representing the medical rehabilitation research community.**

The group recommended that fellowship funding by the NICHD through the K12 mechanism be implemented in cooperation with a rehabilitation medicine organization. This rehabilitation research career development program would be similar to one implemented for pediatric scientists. The Working Group's recommendation of four to eight fellows under this mechanism was based on the number of physiatrists receiving board certification annually (approximately 300) and the percentage of medical school graduates who go on to pursue careers in research (from 2 to 5 percent). According to these estimates, the number of physiatrists entering research training annually may range from 4 to 15. The Working Group expected that the actual number choosing research at this time would tend toward the lower end of the scale.

- **That NICHD fund from four to eight fellows through the K08 clinical investigator award and the K11 physician scientist award mechanisms.**

The K08 and K11 awards are NIH-wide mechanisms. Applicants for these award programs whose interests coincide with those of NICHD would be assigned to the institute for review.

- **That NICHD fund six curriculum development awards through the K07 award program.**

It was anticipated that the curricula developed by the six awardees would serve as models for other institutions. The award program would also include funds to bring the awardees together as a consortium.

Initiatives recommended for NIH-wide implementation were as follows:

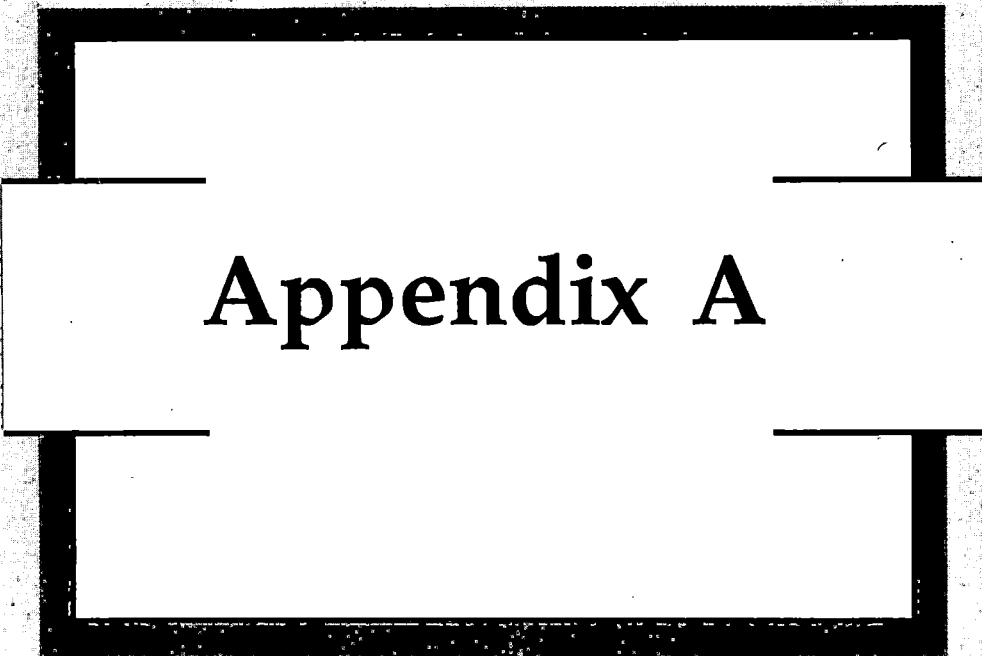
- **That rehabilitation expertise be represented on DRG study sections responsible for reviewing individual fellowship programs (F31 and F32 awards);**
- **That a DRG study section for medical rehabilitation research training be established;***
- **That training of disabled individuals and underrepresented groups receive emphasis;**
- **That 100 F31 and F32 pre- and postdoctoral individual training grants in rehabilitation medicine be awarded NIH-wide, with an emphasis on postdoctoral grants;**
- **That each institute award two T32 institutional training grants in the area of medical rehabilitation research; and**
- **That opportunities for summer fellowships for predoctoral graduate and medical students be made available in the area of medical rehabilitation research using the T32 and T35 mechanisms.**

* One member of the Working Group supported adding rehabilitation medicine investigators to existing study sections but did not endorse the formation of a new study section before its need was assessed.

Conclusion

The meeting of the Working Group on Medical Rehabilitation Research Training was the fifth in a series of initiatives implemented by the NIH to focus on rehabilitation medicine and research. The group's primary purpose was to recommend steps the NIH should take to promote research training opportunities in rehabilitation medicine and to encourage the medical rehabilitation community's greater participation in competing for research training support. This report summarized the group's deliberations and recommendations.

Ten principles guided the development of the group's recommendations. Critical among them were (1) the need to focus on short-term goals and await the formulation of long-term objectives by the National Center on Medical Rehabilitation Research and (2) the importance of breadth, openness, and diversity in the types and disciplines of trainees recruited into the field and in the kinds of training mechanisms used to support such an expanded multidisciplinary effort.



Appendix A

Agenda

Meeting of the Working Group on Medical Rehabilitation Research Training

February 4-5, 1991

*Building 31, Conference Room 4
National Institutes of Health
Bethesda, Maryland
Chairman—Dr. Marcus Fuhrer*

Day One

Morning Session

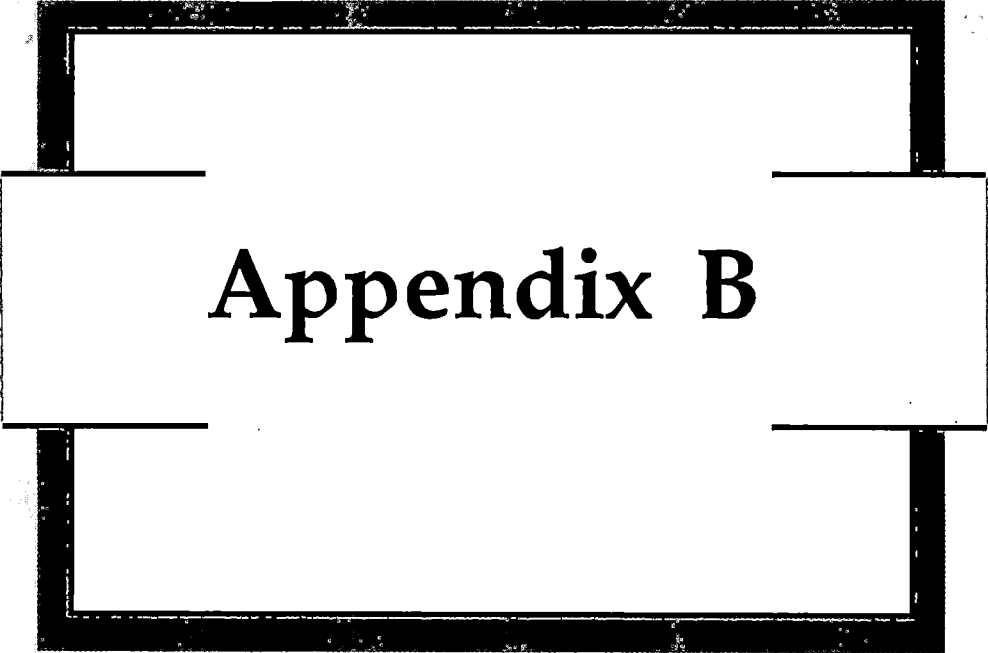
- 9:00-9:05 **Opening Remarks:** Mandate of the Working Group Dr. Jay Moskowitz
- 9:05-9:15 **Overview:** Implementation of Public Law 101-613 by the National Institute of Child Health and Human Development Dr. Duane Alexander
- 9:15-9:25 **Statement by the Chairman:** Meeting Procedures, Expectations, Report Drafting Dr. Marcus Fuhrer
- 9:25-9:35 **Questions and Answers** Dr. Marcus Fuhrer
- 9:35-9:45 **Summary of the Recommendations of the Panel on Basic and Clinical Research Training:** Task Force on Medical Rehabilitation Research Dr. Theodore Cole
- 9:45-10:00 **Questions and Answers/Group Discussion**
Discussion Leader Dr. Marcus Fuhrer

- 10:00-10:15 **NIH Research Training Mechanisms:**
Overview Dr. Walter Schaffer
- 10:15-10:45 **Selected Examples of NIH-Supported Research Training Environments**
National Institute on Aging Dr. Stanley Slater
- Claude Pepper Geriatric Research and Training Centers
 - Claude Pepper Older Americans Independent Centers
- National Institute of Child Health and Human Development Dr. David Gray
- Mental Retardation Centers
- National Center for Nursing Research .. Dr. Janet Heinrich
- Centers of Excellence in Nursing
- 10:45-11:00 **Coffee Break**
- 11:00-11:15 **Questions and Answers/Group Discussion**
Discussion Leader Dr. Marcus Fuhrer
- 11:15-11:25 **Research Career Development—Pediatric Scientist Training Program** Dr. Duane Alexander
- 11:25-12:25 **Examples of Medical Rehabilitation Research Training Programs Nationally**
Baylor College of Medicine Dr. Marcus Fuhrer
Kessler Institute for Rehabilitation Dr. Thomas Findley
University of Michigan Dr. Theodore Cole
- 12:25-12:45 **Questions and Answers/Group Discussion**
Discussion Leader Dr. Marcus Fuhrer
- 12:45-1:30 **Lunch**
- Afternoon Session**
- 1:30-3:30 **Group Discussion**
Discussion Leader Dr. Marcus Fuhrer
- Proposed Items for Discussion:*
- *Who should be trained by the NIH for research in medical rehabilitation?*
 - *What should be the research training setting?*
 - *What is the role of interdisciplinary training for research in medical rehabilitation?*
- 3:30-3:45 **Coffee Break**
- 3:45-5:00 **Group Discussion**
Discussion Leader Dr. Marcus Fuhrer
-

- *What steps can the NIH take to encourage greater participation by the rehabilitation medicine research community in competing for existing research and training awards?*
- *What modifications of current NIH research training mechanisms are needed to meet the special requirements of research training in medical rehabilitation?*

Day Two

12:15 Adjournment

A large rectangular box with a thick black border. Inside the box, the text "Appendix B" is centered. The box has a white background and is positioned in the upper half of the page.

Appendix B

Presenters

Duane Alexander, M.D.
Director
National Institute of Child Health and
Human Development
National Institutes of Health
Bethesda, MD

Theodore Cole, M.D.
Chairman
Department of Physical Medicine and
Rehabilitation
University of Michigan Hospital
Ann Arbor, MI

Thomas Findley, M.D., Ph.D.
Director of Research
Kessler Institute for Rehabilitation
Assistant Professor
Department of Physical Medicine and
Rehabilitation
UMDNJ-New Jersey Medical School
West Orange, NJ

Marcus Fuhrer, Ph.D.
Professor
Department of Physical Medicine and
Rehabilitation
Baylor College of Medicine
Vice President for Research
The Institute for Rehabilitation and
Research
Houston, TX

David Gray, Ph.D.
Mental Retardation and Developmental
Disabilities Branch
National Institute of Child Health and
Human Development
National Institutes of Health
Bethesda, MD

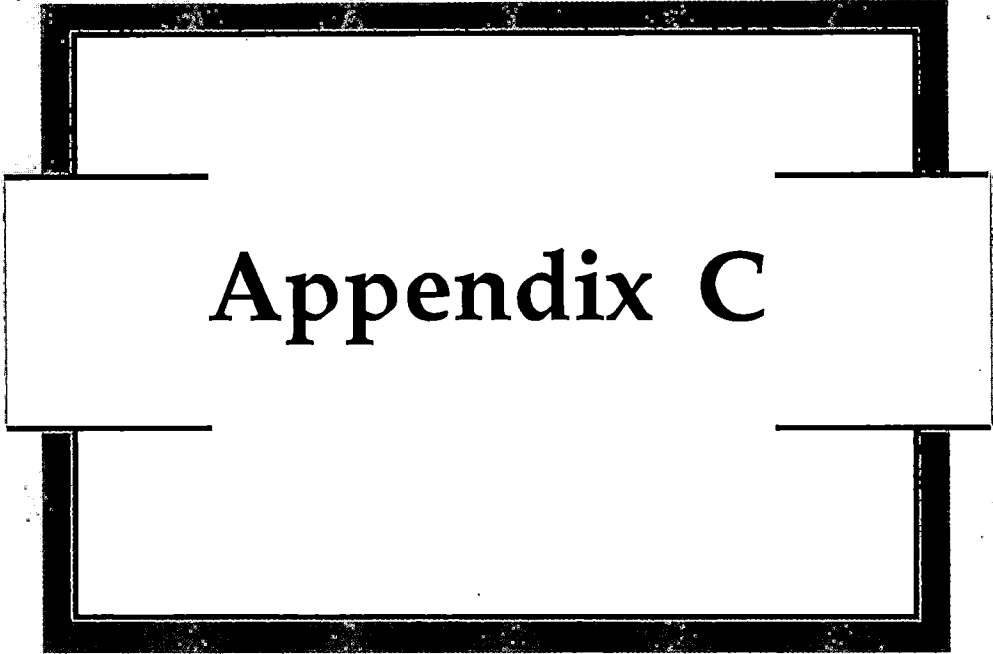
Janet Heinrich, Dr.PH, R.N.
Director
Extramural Programs
National Center for Nursing Research
National Institutes of Health
Bethesda, MD

Laura James, Ph.D., R.N.
Nurse Scientist Administrator
Acute and Chronic Illnesses
National Center for Nursing Research
National Institutes of Health
Bethesda, MD

Jay Moskowitz, Ph.D.
Associate Director for Science Policy and
Legislation
National Institutes of Health
Bethesda, MD

Walter Schaffer, Ph.D.
Research Training Officer
Office of Extramural Research
National Institutes of Health
Bethesda, MD

Stanley Slater, M.D.
Program Director
Geriatrics Research Program
National Institute on Aging
National Institutes of Health
Bethesda, MD

A large rectangular box with a thick black border. Inside the box, there is a horizontal white bar that serves as a background for the title text.

Appendix C

Selected NIH Research Training Support Mechanisms

Discussed by the Working Group on Medical Rehabilitation Research Training

- F 31 Predoctoral Individual National Research Service Award**
- To provide predoctoral individuals with supervised research training in specified health and health-related areas leading toward the research degree (e.g., Ph.D.).
- F 32 Postdoctoral Individual National Research Service Award**
- To provide postdoctoral research training to individuals in order to broaden their scientific background and extend their potential for research in specified health-related areas.
- F 33 National Research Service Awards for Senior Fellows**
- To provide opportunities for experienced scientists to make major changes in the direction of research careers, to broaden scientific background, to acquire new research capabilities, to enlarge command of an allied research field, or to take time from regular professional responsibilities for the purpose of increasing capabilities to engage in health-related research.
- K 07 Academic/Teacher Award**
- To create and encourage a stimulating approach to disease curricula that will attract high-quality students, foster academic career development of promising young teacher-investigators, develop and implement excellent multidisciplinary curricula through interchange of ideas, and enable the grantee institution to strengthen its existing teaching program.

K 08 Clinical Investigator Award

To provide the opportunity for promising medical scientists with demonstrated aptitude to develop into independent investigators or for faculty members to pursue research aspects of categorical areas applicable to the awarding unit, and to aid in filling the academic faculty gap in these shortage areas within health professions institutions of the country.

K 11 Physician Scientist Award (Individual)

For support to a newly trained clinician *nominated* by an institution for development of independent research skills and experience in a fundamental science.

K 12 Physician Scientist Award (Program)

For support to a newly trained clinician *appointed* by an institution for development of independent research skills and experience in a fundamental science within the framework of an interdisciplinary research and development program.

T 32 Institutional National Research Service Award

To enable institutions to make National Research Service Awards to individuals selected by them for predoctoral and postdoctoral research training in specified shortage areas.

T 35 NRSA Short-Term Research Training

To provide individuals with research training during off-quarters or summer periods to encourage research careers and research in areas of national need.
