Special report and editorial

Federal programs for the care and study of spinal cord injuries

HENRY L. HEYL, M.D.
Chairman, Paraplegia Committee, The American Academy of Neurological Surgery

This report summarizes in one document the four federal programs devoted specifically to the care and study of spinal cord injuries. The accompanying editorial emphasizes the need for coordination between these agencies in the optimal use of specific capabilities and separate federal budgets, particularly in the planning for regional spinal cord injury centers.

On December 14, 1971, at the invitation of the American Academy of Neurological Surgery and with the endorsement of the American Association of Neurological Surgeons, an unusual all-day interagency meeting took place at the Hay-Adams Hotel, Washington, D.C. The meeting was in response to a letter addressed to Dr. Richard Wilbur, Assistant Secretary of Defense, Health and Environment, Dr. Robert Q. Marston, Director of the National Institutes of Health, Mr. John Twiname, Administrator of the Social and Rehabilitation Service, and Dr. Marc Musser, Chief Medical Director of the Veterans Administration.

The purpose was to discuss national programs for the care and study of spinal cord injuries. Each of the agencies or departments invited has an active program in this area of interest. The letter of invitation read in part:

"Potentially useful paralyzed citizens and the medical personnel responsible for their care are watching these four related but separately financed federal programs with apprehension as well as gratitude and satisfaction. They are grateful for the impressive sums of money already committed and the realization that much larger amounts will be necessary. They are concerned that there will be wise and efficient comprehension of the total needs of this medical service and research problem, with mutual recognition of each agency's specific capabilities, and minimal indulgence of harmful interagency competition. "Thus, the purpose of this meeting sponsored by a non-government group of intimately concerned professionals is to create the opportunity for each federal agency to learn in some detail what each of the others hopes to accomplish. Since there are obviously overlapping interests, fruitful areas of cooperation may develop, but the prime purpose of the meeting is one of basic communication. In an effort to have the optimal setting for an uninhibited exchange of information and thoughts, we have limited this meeting to the official representatives of the four federal agencies or departments named. Each agency will be asked to summarize its present and projected spinal cord injury programs. An explanation of basic philosophies as well as specific implementation will be important. Therefore, we hope the material representing your department will be prepared and discussed by the most knowledgeable and authoritative members of your staff working in this area."
The official representatives who attended were Brigadier General George Hayes and Colonel Ludwig Kempe for the Department of Defense, Dr. Murray Goldstein and Dr. Warren Huber for the National Institutes of Health, Dr. Sterling Brinkley, Dr. Fritz Cramer, Mr. Corbett Reedy, and Mr. Paul Thomas for the Social and Rehabilitation Services, and Dr. Erich Krueger and Dr. Lyndon E. Lee of the Veterans Administration. Dr. Guy Odom, President, American Association of Neurological Surgeons, and Dr. Henry Heyl, Chairman, Paraplegia Committee, American Academy of Neurological Surgery, attended as hosts and moderator.

The following is a summary of the specific spinal cord injury programs described at the meeting.*

**Department of Defense**

*Acute and Immediate Care of Spinal Cord Wartime Casualties*

In spite of average helicopter evacuation within 30 minutes and decompression within an hour from the time of injury, the Army alone has had 1450 permanently paraplegic casualties of the Vietnam War. These have been evacuated to base hospitals in the Western Pacific area and the United States and transferred to Veterans Administration hospitals for rehabilitation. The relative prevalence of cord transection by missiles in war injuries contrasts with the many civilian accidents in which paraplegia results even though the cord remains in continuity.

**Research**

The U. S. Army supports a modest basic and applied research grant program for projects related to spinal cord injuries. Current projects include both surgical and chemical approaches to the immediate care of acute spinal cord injuries. Investigators seeking such support should address inquiries to: Surgical Directorate, U. S. Army Medical R & D Command, Forrestal Building, Washington, D.C. 20314.

**National Spinal Cord Injury Registry**

The Army is supporting a national study of the natural history of spinal cord injury as reflected in the results of specific treatment by individual surgeons. Cooperating surgeons representing all related specialties are asked to complete a form summarizing physical examination, special studies, operation, and projected care for each spinal cord injury patient. A second examination will be reported at the end of one year. The study is intended to help resolve the many conflicting opinions regarding the best treatment for a spinal cord injury. Inquiries should be directed to the Spinal Cord Injury Registry, Division of Neurological Surgery, Medical University of South Carolina, 80 Barre Street, Charleston, South Carolina 29401.

**MAST (Military Assistance to Safety and Traffic)**

This pilot project is being conducted in a few selected areas in collaboration with the Department of Transportation. The object is to provide military helicopters for rapid and safe transport of civilians severely injured in traffic or other non-military accidents. Thus the assistance is part of an overall civilian plan or system. Inquiries should be addressed to Dr. Dawson A. Mills, Executive Secretary, Military Assistance to Safety and Traffic, Department of Transportation, National Highway and Traffic Administration, 42-15, 400 7th Street, S.W., Washington, D.C. 20590.

**The National Institutes of Health (NIH)**

The National Institute of Neurological Diseases and Stroke (NINDS) is the focal point at the NIH for research and training in the area of spinal cord function and disorders, including the problem of spinal cord injury. The NINDS program is carried out in collaboration with other NIH institutes, such as the Trauma Research Center Program of the National Institute of General Medical Sciences, having responsibilities in related areas. The extramural program supports research projects and training throughout the world. The intramural program supports a number of basic and clinical research projects conducted in the hospital and laboratories of the NIH in Bethesda, Maryland. The collaborative and field research program conducts directed research in which selected intramural and extramural research groups collaborate.

* Checked and approved by each of the agencies concerned.
Extramural Programs
(Dr. Murray Goldstein, Director)

Research Grants. This program, active since 1959, provides individual basic and clinical scientists in universities and hospitals throughout the country and abroad with support for research on normal and abnormal spinal cord function; the current annual budget approximates $2,250,000 in support of projects ranging from basic studies of the acute phase of spinal cord injury and spinal cord regeneration to the development of improved clinical methods of diagnosis and therapy. Grants are also made in support of research workshops and conferences. It is anticipated that, as research interest in the spinal cord increases, the research grants program will grow proportionately.

The Clinical Research Center Program. The clinical research center program provides a team of basic and clinical investigators with long-term support for multidisciplinary institutional research effort. In addition to personnel and facilities for laboratory research, it provides resources for clinical research such as the research expenses of hospital and outpatient evaluation and therapeutic and diagnostic studies. In the 10 years prior to 1970 there were three applications for spinal cord research centers and two of these were supported.

There is increasing evidence that the first few hours after injury are the critical period if progression of spinal cord degeneration is to be prevented. Hints on the mechanism of the pathophysiology of injury and on potential methods of arresting and perhaps reversing the degenerative process are beginning to appear. To take advantage of these developments and to stimulate increased related research, the NINDS in 1970 launched a new program of acute spinal cord injury clinical research centers. This program will concern itself with basic and clinical research on the acute injury as well as community research on emergency treatment and transportation to a clinical center. The program has been initiated by awarding "feasibility" grants of approximately $100,000 to each of six U. S. medical centers to help them plan acute spinal cord injury research centers. The NINDS anticipates that up to four national centers will result from these planning efforts, and that each of these will be supported by grants of $500,000 to $750,000 annually. Consistent with the basic NIH mission, these will be research centers; however, if successful it is expected that they will also serve as models for clinical and community action programs directed to the acute care of spinal cord injuries.

Training Support. The training support program of the NINDS is concerned primarily with the recruitment and education of professional and scientific personnel for careers in teaching and research. The usual training grant or fellowship is discipline-oriented (e.g., neurosurgery, neurology, neurochemistry, etc.) rather than problem-oriented (e.g., spinal cord injury, stroke, sensory prosthesis). Thus, there are no NINDS supported training programs in the area of spinal cord injury per se; rather, there are training programs preparing neurosurgeons, neurologists, neurophysiologists, etc., for careers as academicians, teachers, and investigators.

Grant requests in each of these three parts of the NINDS extramural program are considered under the established non-federal peer review system of the NIH.

Intramural Programs
(Dr. Henry G. Wagner, Director)

The Intramural Research Program. The NINDS is currently conducting a number of studies that are directly or indirectly related to spinal cord injuries. The 8 to 10 principal investigators involved at the NINDS are pursuing individual projects on such diverse subjects as the following: spinal cord regeneration, formation of functional contacts between neurons of the spinal cord and the dorsal root ganglia, immune reactions in nerve regeneration, perfection of models for repeatable experimental spinal cord injuries, study of vascular factors in spinal cord injury as demonstrated angiographically, basic mechanisms of single cell physiology in the spinal cord, and spasticity in spinal cord injuries. The intramural program also supports related conferences, such as the workshop on Movement and Posture to be held at the NIH in March, 1972, in collaboration with the Fogarty International Center; the workshop will emphasize the application of basic research findings to clinical methods and understanding.

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Collaborative and Field Research (C & FR)  
(Dr. Warren V. Huber, Director)

Directed Research. This program supports research planned and supervised by the NINDS, usually at several collaborating outside institutions, under a contractual arrangement. There are at present no "directed" research projects in the field of spinal cord injuries sponsored by the NINDS. However, research programs of this sort on the pathophysiology of head and spinal cord injuries are planned for the near future.

Workshops and Conferences. The C & FR program sponsors special meetings, often in collaboration with the intramural and extramural programs; some of these concern spinal cord injuries. For instance, in May, 1972, a workshop on functional neuromuscular stimulation will be held at the NIH. This meeting will bring together investigators currently involved in the functional activation of paralyzed muscles by electrical stimulation.

Inquiries regarding extramural, intramural, or collaborative research programs of the NINDS should be addressed to the director of the appropriate program, National Institute of Neurological Diseases and Stroke, Bethesda, Maryland 20014.

Social and Rehabilitation Service of the Department of Health, Education and Welfare (SRS)

Two of the six bureaus in this agency are specifically involved in spinal cord injury programs, the Rehabilitation Services Administration (RSA) and the Office of Research and Demonstrations (R & D).

Rehabilitation Services Administration

This bureau cooperates with state or private programs to provide vocational rehabilitation for all disabled persons. The annual total of U. S. citizens receiving this service includes about 1400 with spinal cord injuries. Rehabilitation programs begin 4 to 8 weeks after the injury and continue 6 months to 3 years as required by individual needs.

State Vocational Rehabilitation Agencies.

The bureau provides partial support through a federal formula grant program to seven state owned and operated facilities; the number of spinal cord injury patients in each facility ranges from 30 to 100. The patient progresses through planned levels from early stabilization to ultimate total useful rehabilitation. Two additional facilities are being planned.

Privately Owned Rehabilitation Institutions. The bureau shares in the support of many such facilities both by way of services purchased by the states (as part of the 80% support received from RSA), and by research project grants from R & D.

Training. The bureau supports training in such related fields as physical medicine and physical, occupational or special therapy, by means of grants to institutions.

Inquiries regarding this bureau should be addressed to Mr. Corbett Reedy, Deputy Commissioner, Rehabilitation Services Administration, Department of Health, Education and Welfare, S. Building, 4th & C Streets S.W., Washington, D.C. 20201.

Office of Research and Demonstrations

This bureau provides partial support for the establishment and demonstration of regional spinal cord injury "systems" through the granting of funds for specific projects.

Regional Spinal Cord Injury Systems. In support of this interest, there are plans to develop three or four models of spinal cord injury rehabilitation. Each center, one of which is already functioning, will be financed at approximately $250,000 per year for 5 years, during which R & D support will gradually be phased out as other local sources take over. Thus, this office makes "seed money" available to regional systems for spinal cord injury care and rehabilitation. The principal agency interest is, of course, rehabilitation. However, the importance of proper evaluation and transportation in addition to early and efficient immediate care for spinal cord injuries is recognized as an essential element in any regional system and is thus indirectly included in the concept of rehabilitation.

Related Research Projects. This office awards a limited number of specific grants to nonprofit institutions for the creation and demonstration of improved techniques related to the rehabilitation of patients with spinal cord injuries. The current projects (five) include evaluation of urological techniques, development of catheter-care teams,
improved methods of decubitus ulcer management, and an evaluation of various physical and architectural improvements for paraplegic students at a specific college. Grant applications are reviewed by peer groups as well as agency staff.

Inquiries regarding the activities of this office should be addressed to Mr. J. Paul Thomas, Executive Secretary, Medical Research Study Section, Room 5320, Department of Health, Education and Welfare, S. Building, 4th & C Streets S.W., Washington, D.C. 20201.

Veterans Administration

During World War II this agency recognized the need for special units designed to deliver total comprehensive care and rehabilitation to veterans of the Armed Services with spinal cord injuries. This service has been continuous ever since and is now represented by the broad activities of a Spinal Cord Injury Program developed and directed by the VA Central Office and implemented by 14 regional Spinal Cord Injury Centers.

Spinal Cord Injury Service in Central Office (Dr. Erich G. Krueger, Director)

Some of the most important functions of this service are the following:

- Spinal Cord Injury Centers. The VA Central Office is responsible for their creation and continuing support and guidance. This includes mobilization of participation by related departments of the VA.

- National Consultants to Spinal Cord Injury Centers. The Central Office is responsible for the selection of consultants and their regular utilization on professional matters.

- Liaison. Liaison is maintained with the Armed Services regarding transfer of casualties for continuing care and rehabilitation, with Congress regarding hearings and presentations, with related lay organizations (Paralyzed Veterans of America, and National Paraplegia Foundation) regarding their needs and cooperation, and with the leaders of spinal cord injury programs throughout the world.

- Spinal Cord Injury Conferences. The Central Office is responsible for the organization of biennial conferences at which basic and applied research studies on the spinal cord are reported and discussed. Participants and audience now include outstanding workers in this field regardless of their connection with the VA. The proceedings are published and distributed to all interested persons and institutions. The 19th VA Spinal Cord Injury Conference, a joint meeting with the International Society of Paraplegia, will be held in Phoenix, Arizona, during the fall of 1973.

Training. The centers are involved in training programs in all the professional specialties concerned with spinal cord injuries. A special program to provide overall training to future directors of spinal cord injury centers ("spinal traumatologists") is operating at one center and will be duplicated at a second in July, 1972; selected surgeons are trained for one year during which they receive a full salary determined by their qualifications.

Brief postgraduate courses on the care of spinal cord injuries are conducted annually for civilian, military, and VA physicians and surgeons. The 6th postgraduate course will be given at the Long Beach, California, VA Hospital May 15-19, 1972.

A training program in psycho-social rehabilitation has recently been initiated, emphasizing the comprehensive factors involved in helping a paralyzed person return to a full and productive life.

Spinal Cord Injury (SCI) Centers

Each spinal cord injury center is a specialized service in a larger general VA hospital. Their geographic location reflects concentration of veterans in general and paralyzed veterans in particular plus the availability of specialized staff. The 14 centers now in full operation have a total of 1260 beds, an average of 90 per hospital, with a range from 20 to 205. A total of 240 additional beds are planned at five new centers by 1973. Approximately 1000 service and nonservice connected veterans are being treated in the 14 centers at any one time. Most centers are affiliated with medical schools.

Hospital Care. Facilities are specially planned to meet the needs of paralyzed individuals. Present staffing provides 1.7 medical personnel per patient. Medical care is comprehensive, extending from the status at the time of admission to total rehabilitation or continuing care when needed. One special center for prolonged care has been estab-
lished and more are being planned. There are now about 12,000 veterans with spinal cord injuries eligible for VA care.

Outpatient Care. This service is currently being expanded beyond SCI centers to designated affiliated hospitals staffed and equipped for this purpose.

Research. Research projects related to spinal cord injuries are being pursued by VA personnel at many hospitals and include basic as well as applied projects. Studies of the pathophysiology of acute spinal cord injuries, the electron microscopic picture of spinal cord injury, and the related effects of such experimental therapeutic procedures as focal hypothermia or the use of chemical agents are but a few examples of the current research projects related to spinal cord injury and supported by approximately $750,000 annually. Specific research project support is approved through each hospital, with overall review and endorsement by the Central Office.

All inquiries regarding the Spinal Cord Injury Program of the VA should be addressed to Dr. Erich Krueger, Director, Spinal Cord Injury Service, Veterans Administration, 810 Vermont Avenue, N.W., Washington, D.C. 20420.

Editorial Comment

This issue of the Journal of Neurosurgery features some of the current basic and applied research work on spinal cord injuries. The present increased interest of the U. S. government in spinal cord injury care and research is long overdue. Each of the federal agencies conducting spinal cord injury programs has a key word or phrase characterizing its mission: "Armed Services" for the Department of Defense, "Veteran" for the Veterans Administration, "Rehabilitation" for the Social and Rehabilitation Service and "Research" for the National Institutes of Health. Yet thoughtful coordination of these specific capabilities and their separately allocated supporting funds is essential to the optimal care of U. S. citizens with spinal cord injuries, and to the wise encouragement of related research. The problems are so complex, specialized, and costly that only regional centers or systems, primarily financed by federal funds, can be expected to do the job well.

The meeting reported above was a success in that key representatives of these agencies did meet each other and learn something about each other's programs. But this is only a first step. The principle of realistic interagency coordination and cooperation must become an integral part of all federal planning for spinal cord injury centers. The most important "next step" will be strong endorsement of this principle by individual agency chiefs, and even by chiefs of several agencies acting in concert. This could set the stage for immediately productive discussion of such obvious problems as the selection and allocation of sites or the resolution of interagency problems concerning administration, staffing, and financing at the same or adjacent sites.

At the present time, the Veterans Administration has approximately two-thirds of the total beds in existing or projected spinal cord injury centers. Yet the great majority of paraplegics in the U. S. are not veterans. Correction of this inequity may represent another "next step." The VA acts under a mandate from Congress to care for veterans. It is possible that the time has now come for appropriate federal and non-government groups to promote a change in this mandate which would authorize and finance the total VA care and rehabilitation of any citizen with a spinal cord injury. This would not eliminate the need or desirability for other centers under the supervision of other agencies. Rather, it would make maximal use of our existing assets as we progress toward the optimal but expensive goal of many regional centers.

A final specific "next step" worth considering might be the establishment of a "directed" interagency research project that mobilized appropriate research laboratories and institutions throughout the nation in some major research effort concerned with spinal cord injuries. For instance, the basic discoveries regarding local pathophysiological changes during the first hour or two after spinal cord trauma could be vigorously pursued toward the identification of a related therapeutic procedure that would abort the threat of permanent paralysis by specific
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early treatment. Or the focus could be more general to encompass the entire unsolved but solvable problem of spinal cord regeneration. Individual research motivation will always be the grass roots of scientific progress. But there is also a place for a directed collaborative concentration on some promising phase of a given problem. Spinal cord injury research now offers this opportunity.

It is important that neither we nor the government agencies forget that there is a common purpose for all these programs and that the victims of past and future spinal cord injuries are the focal point of that purpose. If the optimal care and study of U. S. citizens with spinal cord injuries will be best served by coordinated federal action then this is the approach that must be adopted.