

## THE ROLE OF THE PROSTHETICS CONSULTANT IN AMPUTEE REHABILITATION

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Prostheses were originally made by armorers, since practically all replacements of lost limbs were constructed for knights or warriors, who required an artificial hand in order to hold a sword so as to continue their fights. With improvement in surgery and the resultant need for more prosthetic replacements, the independent guild of prosthetists was established. For many years prosthetics service in the United States has been the responsibility of limbmakers who mostly worked independently of any medical service. Following World War II, New York University, recognizing the advantage of a total program of rehabilitation, established in 1948 the Institute of Physical Medicine and Rehabilitation under the leadership of Dr. Howard A. Rusk.

The program of the I.P.M.R. involves the skills and services of a number of professions. The aims in the rehabilitation of amputees, just as in the case of others with a physical disability, are to restore their independence within the limits of their disabilities.

I.P.M.R. is a unit of New York University Medical Center which offers complete rehabilitation services for both in-patients and out-patients. At its inception it was recognized that the full-time services of qualified pros-

thetists would be required for a total program of amputee services. New York University, therefore, became the first university in the United States to engage a prosthetics consultant as a full-time member of its staff and faculty.

The senior position is now filled by a faculty member qualified by training through an apprenticeship in prosthetics and orthotics; through practical experience in private industry and government service; and through participation in research seminars and pilot courses for the development of better prostheses and orthoses.

The value of this program has been fully recognized and is now adopted in several other universities in the United States.

As presently organized the responsibilities of the Technical Director of Prosthetics Services at the Institute of Physical Medicine and Rehabilitation are manifold. His first duty is the prosthetics care for all amputees referred to the Institute. These amputees are thoroughly evaluated by the various members of the Rehabilitation Team and a prosthesis is prescribed by the physician only after full consideration of all aspects of surgery, preprosthetics care, vocational and avocational requirements, as well as the patient's psychological and cosmetic needs. It is at this evaluation that the technical experience and the knowledge of prosthetic devices and component parts by the Technical Director is most helpful in determining the design requirements of the individually prescribed prosthetic device. He discusses the prosthetic construction and recommends the material and the type of suspension as well as the mode of activation for any prosthetic replacement.

Since these discussions normally take place during regular conferences in the presence of the rehabilitation team, they also serve as important teaching functions. The value of the regular weekly conferences is enhanced by the presence and participation of members of the prosthetics profession of the community. A careful check-out of the finished devices assures the patient of the best construction, fit, and function of his artificial limb.

Through his presence at the Institute, the Technical Director as a consultant is able to be of assistance to the therapist; to detect the need for adjustment of the prosthesis to accommodate for physiological changes; and to recommend any changes or alterations that may be justified as a result of training and accomplishment.

The value of this technical advice and service has been recognized by the City of New York, which has contracted with I.P.M.R. for prosthetic consultation for all municipal hospitals of the City of New York.

As a primary university teaching center in physical medicine and rehabilitation, I.P.M.R. is being utilized to an ever widening degree for short term courses to acquaint nurses, therapists, vocational counsellors, and other professions in new and improved rehabilitation techniques. Workshops are conducted and the prosthetics consultant contributes to these training sessions to a steadily increasing degree. It is recognized that with prolonged life through better medical care the chances for eventual amputation are becoming greater. The care for this type of patient requires additional training for all medical and para-medical groups. Dissemination of knowledge in the field of prosthetics has been greatly neglected for too long a time.

I.P.M.R. maintains a small research laboratory for the construction and evaluation of new devices and techniques. This shop was one of the first to introduce plastics for prosthetic as well as orthotic devices. Only recently a new low pressure lamination unit was imported from Europe in order to

investigate the possibility of constructing sockets and splints of very irregular shape such as may be required for hip and shoulder disarticulation. It is believed that through this method lighter and stronger plastic sockets with a more functional shape can be constructed. The importance of minimal weight compatible with required strength is recognized because an increasing proportion of new amputees falls into the older age group where cardiac reserve is impaired and energy expenditure must be reduced to a minimum.

On the other extreme we find a greater recognition for the need of prosthetic care of the child born with the absence of one or more limbs. In the upper extremities this anomaly is most frequently confined to the unilateral absence of the hand and part of the forearm.

Congenital anomaly of the lower extremities, however, is very frequently combined with growth disturbance of the arms as well. Several children with the absence of all four extremities have been referred to I.P.M.R. and prosthetic replacements have been constructed for these very severely handicapped patients.

The most widely known case is Juan Yopez. Juan was born with feet and hands but without arms or legs. He now walks to school daily, using prostheses which were designed at the prosthetics laboratory. He has been fitted with bilateral Canadian-type hip disarticulation prostheses. Many different constructions were designed and tried. Due to the absence of arms he could not utilize standard crutches. Special devices fitted over hands, which are attached to his body by muscular tissue only, enable Juan to perform a swing-through gait. His lower extremity devices are provided with locking mechanism for knee and hip in order to provide stability during ambulation. They can be unlocked by use of his feet, which originate from the hips.

Prosthetic requirements for these types of anomaly differ greatly from one case to another, and a great deal of experimentation and extensive experience are required in order to reach an acceptable solution for the many problems created by these handicaps.

The Institute is part of the Child Amputee Research program which is conducted by the Committee of Prosthetics Research and Development. Through membership in this organization it is possible to participate in the different research projects, to exchange experiences, and to keep abreast of the latest developments in devices and techniques.

Great progress has been made in amputee service in the United States. This, to a great extent, is the result of accelerated research instituted by the Federal government following World War II. The results of these efforts have been made available to veterans and civilians alike. The American Orthotics and Prosthetics Association has helped to make this service possible by a complete reorganization of the "old-time" limb and brace shops. Through a certification plan for personnel and facilities, the standard of service has been elevated. I.P.M.R. has recognized this endeavor, and the technical personnel and the laboratory are certified by the American Board for Certification. New York University has been in the forefront of this evolution of rehabilitation service.

The results of these efforts have not been confined to the United States. Through extensive foreign training the advantages of an improved amputee program are becoming available to practically every country of the world. Both physicians and technicians have utilized the facilities of I.P.M.R. in order to study United States prosthetic techniques. Prosthetic and orthotic



Fig. 1—Juan's first prosthesis, according to the walking doll principle.

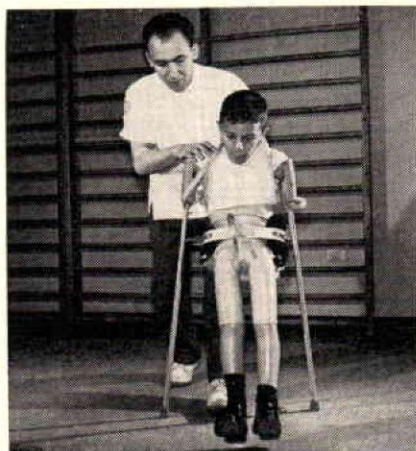


Fig. 2—Juan learns to walk.

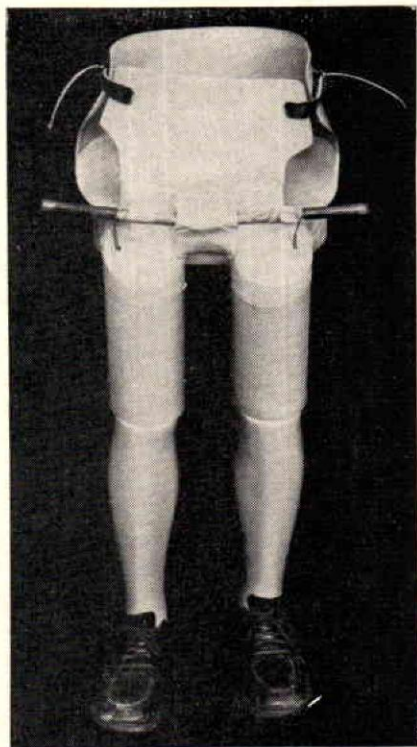


Fig. 3—Juan Yopez—The present prosthesis.

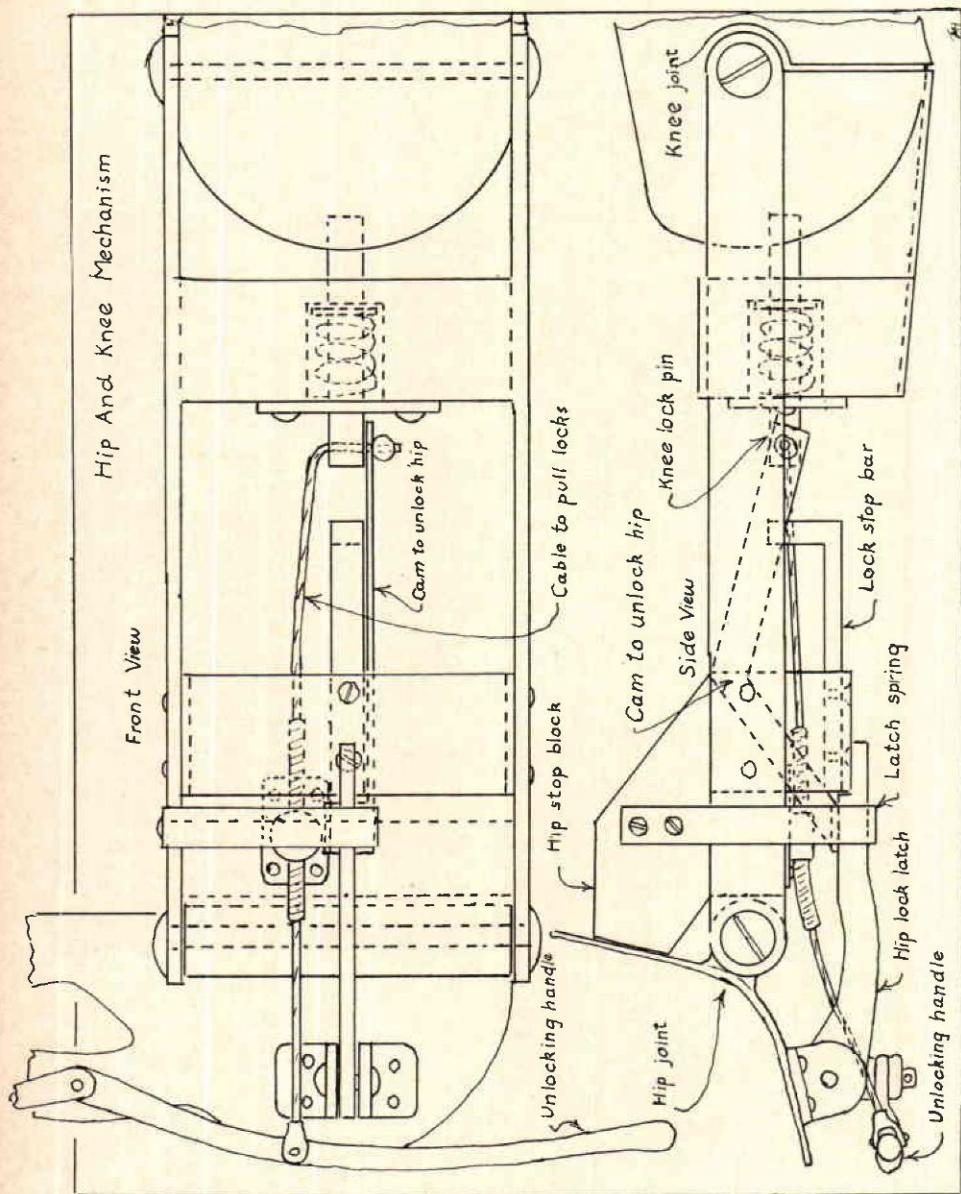


Fig. 4—Detailed drawing for knee and hip lock by Townsend Hicks, designer, Orthotics Unit.

# Hip And Knee Mechanism

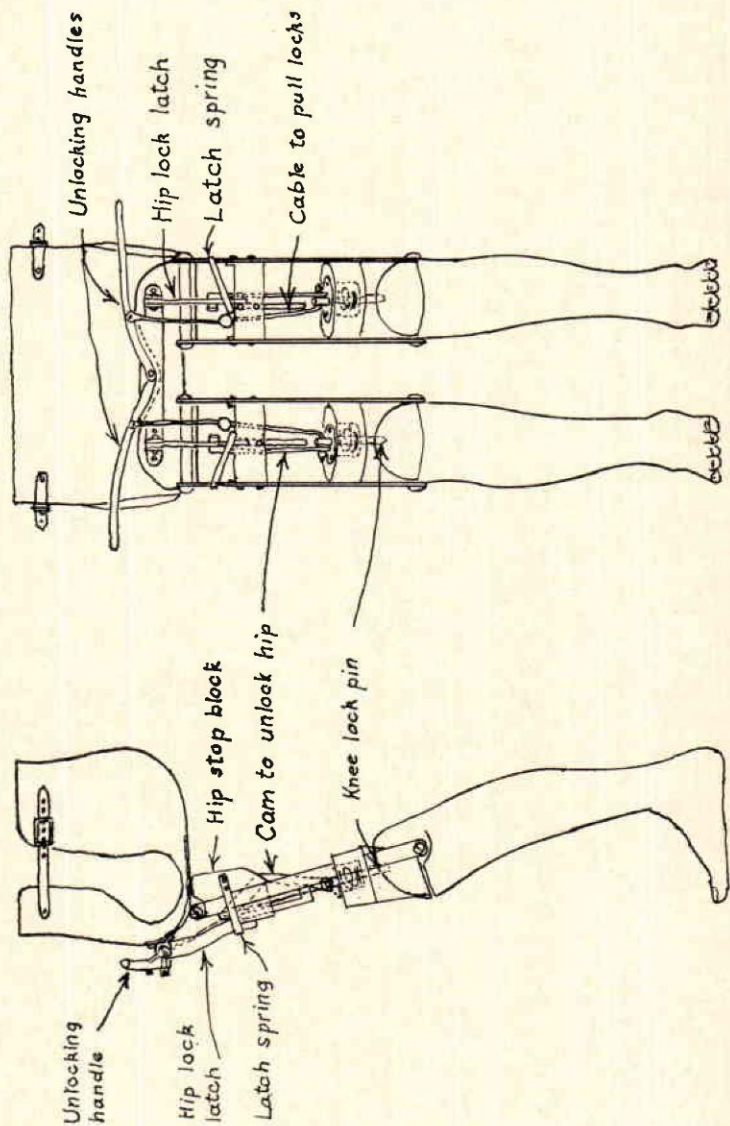


Fig. 5—Detailed drawing for knee and hip lock by Townsend Hicks, designer, Orthotics Unit.

trainees from many foreign countries have been provided with fellowships by governmental and voluntary agencies. These include Argentina, Bolivia, Burma, Canada, Colombia, Cuba, El Salvador, France, Guatemala, Japan, Korea, Lebanon, Philippines, Portugal, Spain, Thailand, Venezuela, and Yugoslavia. Training has been provided at our own laboratory and has been arranged through government or private shops in the New York area. After completion of their traineeships, these professional personnel have returned to their own countries not only with an improved technical knowledge but also with a better understanding of the American way in prosthetics service.

The United Nations has long realized the implications of an almost total absence of amputee service in many of its affiliated countries. Surveys have been conducted by members of their Bureau of Social Welfare and through efforts of the United Nations; consultants have been provided in several areas.

The incumbent Technical Director of Prosthetics Services at I.P.M.R. was appointed by the United Nations to conduct a two-month training course for Lower Extremity Prostheses at the National Rehabilitation Institute at Tokyo, Japan. It is gratifying that, according to an official report by the Japanese government to the United Nations, these training courses in United States techniques have been the beginning of an organized research and training program which, it is claimed, has benefitted the Japanese amputee more than all previous programs.

Since Dr. Howard A. Rusk, the Director of I.P.M.R., is the Past President of the International Society for the Welfare of Cripples and is also President of the World Rehabilitation Fund, it is only natural that the Prosthetics Service of the Institute has become active in the affairs of the international amputee rehabilitation services. The Institute's Prosthetics Consultant became one of the early members of the Committee on Prostheses, Braces and Technical Aids. Following the Training Courses in Japan he continued his trip to advise rehabilitation centers in Korea, Burma, India, Lebanon and Jordan, in order to assist the World Rehabilitation Fund, the American-Korean Foundation, and the International Society for the Welfare of Cripples, the World Veterans Fund, and the UNICEF in planning prosthetics services in these countries. Detailed plans for prosthetics shops, including needed personnel, tools and material, were submitted to the interested agencies. Similar services have recently been rendered to CARE for establishment of prosthetics shops in many technically underdeveloped countries.

The need for these services is still as acute as ever. When Dr. Rusk returned from an extensive trip to Latin America in late 1959, he reported on the serious delays in rehabilitation in most of these countries, delays which were to a great extent caused by the total lack of prosthetic and orthotic devices. Through the cooperation of the Metropolitan Orthopedic Appliance and Limb Manufacturers Association, the World Rehabilitation Fund has been able to ship several hundred used braces and prostheses to some of these countries. These efforts will be further supported by the shipment of component parts which will be purchased from income of the Spring Seminar of MOALMA and AOPA, Region No. 2.

Amputee Service at I.P.M.R. is not confined to New York University or to the United States, but endeavors to carry the results of research and teaching to all those whose happiness and accomplishments depend upon replacement of any missing extremity, missing either as a result of an unknown vagary of nature, or of war, accident, or disease.