

The Children's Prosthetics and Orthotics Program¹

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DURING the early 1950s, pioneering clinicians in the management of the child amputee repeatedly insisted that children were not miniature adults, to whom modes of fitting developed for adults could be applied indiscriminately. The physicians argued that these children had characteristics and problems that required special study and treatment. Primarily because of the missionary efforts of these men, the Committee on Prosthetics Research and Development in February 1956 moved from an indirect role in the area of children's prosthetics to an active and dynamic one by the establishment of a standing Subcommittee on Child Prosthetics Problems (SCPP). The first chairman, Charles H. Frantz, M.D., guided the activities of the subcommittee until 1965, when he was succeeded by George T. Aitken, M.D. The current membership of the subcommittee appears at the end of this article.

Concurrently with the establishment of the SCPP, the Child Prosthetics Studies program at New York University was created under the direction of Sidney Fishman, Ph.D. From its inception, the New York University program has been closely related to the activities of the Subcommittee on Child Prosthetics Problems. In essence, New York University has acted as an executive arm of the subcommittee in

implementing many of its recommendations. This relationship led to the initiation and completion of numerous significant studies, some of which were: (1) extensive laboratory and field evaluations of various models of the APRL-Sierra no. 1 hand; (2) tests of the Dorrance juvenile hand, size no. 2; (3) studies of the application of the quadrilateral suction socket to the juvenile above-knee amputee, and of the patellar-tendon-bearing prosthesis to the skeletally immature below-knee amputee; (4) a field evaluation, preceded by the development of a fabrication manual and an instructional course, on the Minister-type fitting for the below-elbow amputation stump; and (5) laboratory and field studies of the CAPP electric cart.

Significant nonevaluation activities included studies of the prosthetic fitting of children amputated for malignancy, numerous surveys and census-type studies of children under treatment, and follow-up studies related to the early work of Frantz and O'Rahilly in the classification of congenital limb deficiencies, with efforts to achieve an internationally acceptable system.

As a result of the activities of the subcommittee and of the studies conducted at its instigation by New York University, a number of important by-products have emerged:

1. The treatment of the limb-deficient child has become a recognizable subspecialty in medicine that has attracted many competent physicians.

2. The principle of fitting the child with congenital limb deficits at a very early age has been well established.

3. The early fitting of the juvenile who loses a limb because of malignancy, other

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diseases, or trauma has also become generally accepted.

4. Developers and manufacturers have been encouraged to produce prosthetic components for all age levels of the child-amputee population.

COOPERATIVE CLINIC PROGRAM

A significant early action of SCPP was to bring together in August 1958 a group of persons with a known interest in the treatment of the child amputee. Included were the chiefs of 11 existing child-amputee clinics who agreed to cooperate in studies seeking improved treatment for the limb-deficient child. The participants in this historic meeting were:

Gen. F. S. Strong, Jr., Washington, D.C.
Tonnes Dennison, Beverly Hills, Calif.
George T. Aitken, M.D., Grand Rapids, Mich.
Carleton Fillauer, Chattanooga, Tenn.
Charles H. Frantz, M.D., Grand Rapids, Mich.
Colin A. McLaurin, Chicago, Ill.
Charles Radcliffe, Ph.D., Berkeley, Calif.

Harry Campbell, Los Angeles, Calif.
Leon DeVel, M.D., Grand Rapids, Mich.
Edward Hitchcock, New York, N.Y.
Bertram Litt, New York, N.Y.
Edward Peizer, Ph.D., New York, N.Y.

Anna M. Bahlke, Albany, N.Y.
Milo Brooks, M.D., Los Angeles, Calif.
Capt. Thomas Canty, Oakland, Calif.
Carleton Dean, M.D., Lansing, Mich.
George G. Deaver, M.D., New York, N.Y.
Sidney Fishman, Ph.D., New York, N.Y.
Col. Maurice Fletcher, Washington, D.C.
James Glessner, M.D., Newington, Conn.
J. Leonard Goldner, M.D., Durham, N.C.
Richard E. King, M.D., Atlanta, Ga.
Claude N. Lambert, M.D., Chicago, Ill.

Arthur J. Lesser, M.D., Washington, D.C.
Robert Mazet, Jr., M.D., Los Angeles, Calif.
John R. Moore, M.D., Philadelphia, Pa.
Frank Potts, M.D., Buffalo, N.Y.
Frederick Vultee, M.D., Richmond, Va.

Subsequently, other child-amputee clinics sought affiliation with the cooperative program, and, upon meeting the criteria or standards established by the subcommittee, additional clinics have been accepted into the cooperative research endeavor. Thirty clinics, broadly distributed, have now been accepted.

A large proportion of the studies authorized by the subcommittee have been carried out by the participating clinics under the guidance of New York University.

In addition to the 30 clinics currently enrolled in the cooperative program, contact is being maintained with 36 other child-amputee clinics.

PROJECTS

By the mid-1960s, it had become apparent that significant advances had been made in prosthetics generally. Many of the improved fitting techniques that had been developed were found to be applicable to children, and numerous components of advanced design had been made available for use by the child amputee. As a result, children with less severe or with uncomplicated limb deficits, of either congenital or acquired origins, could be treated, and reasonably satisfactory results could be expected. However, the management of the child with severe losses, particularly those affecting both upper limbs at high levels, left much to be desired. The solutions to these problems were considered to be in the successful application and control of externally powered devices. Although available components and systems of this type were (and are) relatively crude, they are regarded as the hope of the future, and a major evaluation and redevelopment effort is being mounted. Already in progress or about to be initiated as a result of prior action by the Subcommittee on Child Prosthetics Problems are a number of studies of great potential value in the evaluation of improved devices and treatment procedures.

Studies will be conducted by New York University, through the participating clinics, on the Ontario Crippled Children's Centre (OCCC) coordinated electric arm, an advanced model of the Michigan Crippled Children Commission feeder arm, the OCCC electric elbow, the Rancho Los Amigos Hospital electric elbows, the Otto Bock myoelectric hand, and the Viennatone myoelectric hand.

At the request of SCPP, New York University has conducted an annual census of

CHILD AMPUTEE CLINICS PARTICIPATING IN THE
COOPERATIVE RESEARCH PROGRAM



Fig. 1.

the child amputees who are being treated at the cooperating clinics. For 1969, the data indicated that the total population under treatment was 4,625—an increase of 236 over the prior year. An expanded census relative to the calendar year 1970 has been completed.

SPECIALIZED FITTING CENTERS

At its meeting on October 21, 1967, the Committee on Prosthetics Research and Development approved a proposal by the Subcommittee on Child Prosthetics Problems that an ad hoc committee be established to develop a detailed plan for the creation of specialized prosthetics fitting centers for severely handicapped children. At its meeting on June 12, 1968, CPRD received the report of the committee, which presented criteria for operation of the centers. This plan, which had been previously approved by the child-amputee clinics, was also approved by CPRD.

CHILDREN'S ORTHOTICS

At its meeting on November 4-5, 1969, the Committee on Prosthetics Research and Development charged the Subcommittee on Child Prosthetics Problems with the responsibility for enlarging its sphere of activities to include children's orthotics. An ad hoc committee of SPP was appointed to investigate the implications of this new responsibility and to make recommendations for its implementation. It should be noted that the Subcommittee on Design and Development of CPRD had already conducted a number of meetings and workshops on orthotics topics, particularly in the area of lower-extremity bracing, which was the first segment of the orthotics field to be investigated, and many items with possible applications to orthopedically disabled children were beginning to emerge from this work.

Upon the recommendation of the ad hoc committee, a number of selected lower-extremity orthotics items that had emerged from the design and development effort and several bracing and ambulation aids that had been developed at the Ontario Crippled Children's Center were demon-

strated at a meeting of amputee-clinic chiefs on June 11, 1970, and the clinic chiefs were polled as to their interest in clinical applications of the items demonstrated. Their responses were tabulated by New York University and revealed considerable interest in virtually all items. The Subcommittee on Child Prosthetics Problems reviewed these findings at its October 16, 1970, meeting and recommended that NYU undertake the recruitment of a nucleus of clinics interested in a cooperative research program on treatment devices for cerebral palsy, Legg-Perthes disease, and myelomeningocele. It was further recommended that orthopedic surgeons currently participating in the program be surveyed to identify clinics they knew to be interested in these problems. Subsequently, NYU reported that three clinics in the New York City area had indicated an interest in participating, and that discussions were being held with these clinics to develop a format for the initiation of a mutually useful program.

EDUCATION

A major requirement for participation in the cooperative clinical program has been that clinic personnel attend the appropriate upper- and lower-extremity courses at one of the three universities offering such programs. Moreover, since December 1961 at Northwestern University, and since 1964 at the University of California at Los Angeles, 26 courses in the management of the child amputee have been offered to 864 students, including 450 physicians, 238 therapists, and 146 prosthetists. New York University has offered special lectures in the management of the child amputee in its regular prosthetics courses. In connection with the evaluation of specific items where special application skills are required, courses of instruction have been given to the participants.

All these educational activities have tended to provide an increasingly higher level of competence among physicians and others in the management of the child with limb deficiencies. Moreover, the Child Amputee Program has been a direct par-

ticipant in, and contributor to, the general transition procedures governing the overall prosthetics research and education program. These procedures have served to bring new research-derived information directly and expeditiously to the consumer through courses of instruction and published materials.

PUBLICATIONS

In May 1961, at a meeting of the 12 clinic chiefs then participating in the cooperative program, the chairman of the Subcommittee on Child Prosthetics Problems proposed the creation of a bulletin or newsletter that would serve as a medium for the exchange of information between the clinics. The idea was received enthusiastically by the clinic chiefs, who undertook to provide articles on a scheduled basis. The first issue of the *Inter-Clinic Information Bulletin* was published in October 1961. It was six pages long, and 100 copies were distributed. Now, 10 years later, the *Bulletin* is a 16-page printed booklet with circulation in excess of 2,700 copies per issue.

Initially, *ICIB* dealt solely with amputees and prosthetics management. In the past year, however, in line with the general trend, the scope of the *Bulletin* has been enlarged to include orthotics topics. Since 1967, *ICIB* has been catalogued in the Library of Congress (Catalogue Number 67-304).

At the last four annual meetings of the chiefs of the cooperating clinics, a feature of the program has been a symposium on a

selected area of child-amputee management. The proceedings of the symposia held in 1967 (*Normal and Abnormal Embryological Development*), 1968 (*Proximal Femoral Focal Deficiency*), and 1969 (*Surgical and Prosthetic Management of Lower-Extremity Anomalies*) have been published and distributed to clinicians, medical schools, and other interested groups. The proceedings of the 1970 meeting (*The Child with an Acquired Amputation*) are being prepared for printing.

Effective communication with and between the clinics has been maintained by means of the *Inter-Clinic Information Bulletin*, the annual meeting of clinic chiefs, and personal contacts through CPRD and NYU staff. These factors have been critical elements in the extremely successful operation of the cooperative child-amputee research program. As the scope of the endeavor now expands to include conditions requiring orthotic assistance, the same elements may be used to develop an equally successful program for children with orthopedic disabilities other than amputation.

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