TECHNOLOGY AND THE DISABLED

The Development of the Northern Ireland Prosthetics/Orthotics/Aids Service

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HERODITUS, in 484 BC made one of the first of many references to the use of devices for the disabled, but it was not until the 1800's that the inventiveness of the Victorian era was to apply technology to the problem of the disabled on a large scale. The impression is that since the Victorians, we have not advanced all that much, although we are on the brink of another era of advance.

In 1800, James Potts of London produced an artificial leg with an articulated knee and ankle, and the ankle even had a ‘toe lift’ during the swing phase. The leg acquired fame by being provided for the Marquis of Anglesea, who had an above-knee amputation at the battle of Waterloo in 1815. The limb bears a remarkable resemblance to those produced today. Verduin, in 1696 produced a below-knee limb that was reintroduced by Serre in 1826, and this also is remarkable like the ‘Number 8’ limb of today. Ernst, who was an orthopaedic technician, published ‘Orphopaedic Apparatus’ in 1861, which contains an illustration of ‘Dr. Little’s walking Apparatus’, which is almost identical to the long-leg weight-relieving caliper of today. It would seem that the disabled of today are coasting along on the inventiveness of the Victorian.

There are signs of an upsurge in the application of technology to assist the disabled. In the 1960's, engineers working with orthopaedic surgeons in the United States started to scientifically investigate the basic problems of the disabled. Rehabilitation engineering centres were created, based on university orthopaedic hospitals. Rehabilitation engineering is that aspect of bio-engineering that is applied to the long-term disabled, and amongst other things, includes artificial limbs, appliances, aids, mobility and environmental control. Further evidence of change lies in the use of the word ‘prosthetics’ to refer to the use of artificial limbs, and the word ‘orthotics to refer to the use of appliances. The basic research resulted in devices that had to be developed and evaluated, and then introduced to the disabled. This is necessarily a long slow process, but the results of the work are now starting to come through.

The 1970's saw the introduction of several bio-engineering courses in the United Kingdom, and even the medical profession became aware of the term. Centres at the University of Strathclyde and the Paddington Technical College also started three year courses for prosthetists and orthotists, to replace the old apprenticeship system. At several universities and other centres, units were set up where doctors and bio-engineers collaborated in the application of technology to the disabled.

On the international plane, the International Society for Prosthetics and
Orthotics was formed, which also took in the rehabilitation engineering field, and provided a world-wide flow of information between centres, and promoted collaboration.

NORTHERN IRELAND EVENTS

In the early 1970's, doctors, the administration and the voluntary organisations became aware of the events taking place in the care of the disabled, and the need to upgrade services. The Northern Ireland Hospitals Authority, set up a working party in 1973, under the chairmanship of Mr. Roy Whitlock, to report on the prosthetic and orthotic services in Northern Ireland. At the same time a consultant visited the United States to see the advances that were taking place. Because of the reorganisation of the Health Service, the report was presented to the Eastern Board in 1975. The main recommendations included the building of an orthotic workshop at Musgrave Park Hospital, to be leased to commercial orthotic manufacturers. This was a similar arrangement to the already existing commercial prosthetic workshop at the Limb Fitting Centre at Musgrave Park Hospital. It was also recommended that the Limb Fitting Service should be better integrated into the hospital and community services. Finally, it was recommended that a rehabilitation engineering centre should be built at Musgrave Park Hospital, similar to those seen in the United States, and this would provide specialised services in that field. The recommendations were accepted by the Eastern Board, and with commendable speed, the Rehabilitation Engineering Centre and the contractors commercial workshop were completed in 1979. At the same time the Eastern Board made provision for six trainees to be sent to the three-year course at the University of Strathclyde to become qualified prosthetists/orthotists.

After the opening of the Rehabilitation Engineering Centre, it was found difficult to integrate the Limb Fitting Service with the hospital and community service until it was integrated with the other services for the disabled. It was also apparent that there had been no provision for improving the supply of aids for the disabled. The decision was taken to combine the Limb Fitting Service and the Wheelchair Service with the Rehabilitation Engineering Centre, and to open an Aids Demonstration Centre. The latter was carried out in the area vacated by the invalid cars, which were being phased out. The combined service came into being in 1980, and was called the Prosthetics/Orthotics/ Aids Service.

There had always been co-operation in Northern Ireland between the Health Service and scientific departments of academic institutions in the province. With the opening of the Rehabilitation Engineering Centre, the Department of Technology of the Ulster Polytechnic and Queen’s University, started a fruitful co-operation to apply technology to the disabled.

At the same time, the Department of Health continued to be aware of the need to improve the lot of the disabled. A grant was made to the Rehabilitation Engineering Centre to study gait. The OUTSET survey was also funded, to provide a survey of what the disabled felt that they needed, and this included technological needs. Finally, the Department undertook a reappraisal of the rehabilitation services by means of working parties, although implementation of findings will be hampered by the financial situation.
The organisation of the provision of devices to assist the disabled in the United Kingdom have long been a subject of examination. The BMA Planning Report of 1968 on 'Aids for the Disabled' spoke of glaring defects, and of administrative and educational deficiencies. It condemned the administration of the limb fitting separate from the Health Service, and suggested changes in almost every aspect of the service. The Denny Report of 1970 recommended the integration of the Scottish Limb Fitting Service with the Health Service and this has been implemented. Northern Ireland has gone further, and has provided an integrated service for the provision of artificial limbs, appliances and aids, and has also integrated this with education and research in these subjects. This is a unique situation in the United Kingdom, and indeed, there are few countries that have had the opportunity to provide such an overall coverage of the problems of the disabled.

THE PROSTHETICS/ORTHOTICS/AIDS SERVICE

There are obvious advantages in having all the services providing devices for the disabled on one site, and combining them. The staff providing the service are common to all, and consequently there is considerable co-operation. It encourages the 'total' approach to the disabled patients' problems, rather than a 'demand and supply' approach. To labour the point, the staff have an interest in 'the patient', rather than in the obvious primary disability.

There is also, because of the wider spectrum of responsibilities, an awareness of the need to improve services as a whole, in the hospital service and in the community. To this end there has been an active attempt to give information to all sections of the hospital and community services by means of courses, lectures, symposia and demonstrations. Many of the courses have specially prepared manuals provided from the Rehabilitation Engineering Centre, for suitable literature is scarce. This educational programme has proved popular, and at present demand outstrips supply.

Because of the volume of work, and the encouragement of referral of patients with difficult rehabilitation problems, it is inevitable that clinical research has to be carried out to solve individual problems. Sometimes, as the result of success with an individual, it is seen that a similar solution can be applied to a wider group. The capacity of the Rehabilitation Engineering Centre to undertake the design and manufacture of devices, and the regional connections of the service allows a widely available and specialised service in a neglected area of need. The device created to lift weak arms has been extensively applied to children with muscular dystrophy, and the 'Musgrave Park drop-foot polypropylene splint' is now in wide use. A Gait Analysis Laboratory has been set up with a research grant from the Department of Health, to investigate the effect of devices on gait. This has benefited another project to depict discrete pressure areas under the foot, which is financed from private funds.

THE REHABILITATION ENGINEERING CENTRE

Rehabilitation engineering is that branch of bio-engineering that deals with the long-term disabled. The Centre is based on an American concept, and provides specialised advice and devices over the whole spectrum of locomotor disability.
Until it came into being, there was no source of specialised advice about the application of technology to the disabled, nor was there the facility to provide individual devices of a specialised nature. The Centre operates clinics for rehabilitation problems, with an orthopaedic surgeon and bio-engineer, and they can call on specialised advice from the Limb Fitting Centre, the Wheelchair Service and the Aids Demonstration Centre.

There is a workshop with a capacity to make orthoses, prostheses, aids, mechanical, electrical and electronic devices. There is a Gait Analysis Laboratory, and computer facilities. The workshop is staffed by qualified prosthetists/orthotists, appliance makers and a fitter. They produce the devices that are not normally available from commercial sources.

Patients with problems are referred. If the solution is routine, then the patient is referred to a commercial source on the site. If the solution is complex, then a device can be created and made within the Centre. The Centre also has an interest in a wide variety of bio-engineering problems, and assists and promotes projects, ranging from orthopaedic instruments and implant devices, to projects for schools and universities.

THE LIMB FITTING CENTRE

The Service provides an assessment for all amputees, and the prescription of artificial limbs. These limbs are produced by commercial firms who have workshops within the Centre. Consultation with the Centre before amputation is encouraged, and also early referral after operation.

THE WHEELCHAIR SERVICE

Some 12,000 wheelchairs are on loan throughout the Province, and the chairs are supplied and maintained through the service. There are technical officers who visit the patients in their homes and in institutions, and there are clinics for patients with particular problems. There is also collaboration with the Rehabilitation Engineering Centre and the Aids Demonstration Centre to adapt existing wheelchairs and to provide suitable seating.

THE AIDS DEMONSTRATION CENTRE

The Centre at Musgrave Park Hospital has a wide variety of aids on display, which can be sampled by patients referred there. An occupational therapist provides assessment and advice, and closely collaborates with District Occupational Therapists. If assessment finds that no suitable device is available then there is collaboration with the Rehabilitation Engineering Centre to adapt an existing device, or to design and make a suitable device.

CONCLUSION

The disabled make use of a wide variety of devices to diminish disability. The 1980's will see an increasing interest in the provision of technology for the disabled. Northern Ireland, through the Prosthetics/Orthotics/Aids Service is in the unique position of having a Regional service that can undertake this type of work and can deliver the services to the disabled.