

OPENING DOORS THROUGH TECHNOLOGY

The European Community makes technology a priority in order to improve function in their disabled population and prevention of disability.

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Technology is opening many doors for people with physical and mental limitations. Technology provides access to information and allows people to communicate in new ways. Technology can likewise enhance mobility, sight and cognition for individuals with disabilities. The utility of technology is limited only by lack of imagination.

When thinking about technology and disabilities, it is also important to realize that a large segment of the elderly population have functional deficits which also may be enhanced by technology. Given that technology is improving the lives of many, rehabilitation providers are incorporating technology into their programs designed to restore function for the elderly and disabled. In addition, technology has advanced the role of preventive medical techniques to reduce the incidence of disability.

While it may not be surprising that the practice of rehabilitation has been fundamentally affected by the advent of technology, it is surprising how these technological advances in rehabilitation are fostered by the international community. Member nations in the European Community have been particularly involved in addressing the technological aspects of rehabilitation and the needs of their disabled citizens. Their efforts have led to advancements in assisting individuals cope and function with existing disabilities, the prevention of disability and in the rehabilitative process itself.

Disseminating Information to Assist Individuals in Coping With and Reducing Physical and Mental Impairments

One rehabilitation goal of significant focus for European nations is the dissemination of information to disabled people. Much research has been conducted into how computers and telemedicine practices may be

extended to the benefit of the disabled. Several European initiatives have been developed to advance the utility of this technology to the disabled. The benefits explored are far-reaching. They include allowing people to receive rehabilitation information while far removed geographically from a medical center, to be employed from their homes, and to disseminate information that allows them to take more full advantage of public transportation and other services.

Germany has been particularly active in using telemedicine and other communication services to provide rehabilitation information to elderly disabled people. One Germany-based project employed both videoconferencing-based communications and a computer-based information system to provide rehabilitation. The patients in the project were able to obtain information regarding their care directly from a medical center with a wide range of professionals including physicians, physiotherapists, social workers and neuropsychologists. The service offers the additional benefit of allowing specialists to be consulted without requiring the disabled individual to endure the expense and difficulty of travel.

In addition to its European Nations, the United States has also begun exploring the opportunities presented through telemedicine. Recently, Sister Kenny Institute of Allina Health System in Minneapolis, Minnesota was awarded a \$5 million federal grant from the National Institute on Disability and Rehabilitation Research to develop rehabilitation programs through the use of telemedicine. The program's goal is to increase the patients' access to health professionals.

The use of telematics is not of value to disabled people solely to obtain information regarding their health care. Additional benefits of the technology are to increase the ability of disabled people to participate in employment and in the use of public services. One project involving a host of European Community members has trained disabled people in the use of computer-based telematic and audio-visual communication devices. The training is aimed at providing vocational training and, subsequently, employment opportunities for disabled people.

Another technological endeavor of the European Congress is the Transport Using Rehabilitation Technologies Leads to Economic Efficiency (TURTLE) Program. The program was designed to develop a public information system for the benefit of the disabled and elderly populations. The system was designed to allow the disabled and elderly to use information systems to be afforded the same opportunities as the general

population to be consumers of products and to utilize public transportation. To address public transportation, the TURTLE system provides for real-time transportation service information regarding scheduling, location of the service, route information and the physical accessibility of the mode of transportation. Other real-time information services in existence were not designed specifically for the needs of disabled and elderly individuals. The TURTLE program will integrate the assistive technologies required for the disabled and elderly to effectively utilize the services. Gauging the successful aspects of European-developed communication systems, the United States and other countries will have the opportunity to further their own services for the disabled.

Adaptive Technology for Disabled Individuals Confined to Wheelchairs

Another example of European nations' use of technology to mitigate the effects of disability can be illustrated by various programs that improve the ability of disabled people to use wheelchairs. While wheelchairs have significantly improved internationally over the years in their mechanics and means of locomotion, refinements continue to be advanced. Two such programs are centered in England and Ireland, respectively.

In England, a technological development has been used that combines electronics, computers and a pressure sensor to reduce the incidence of sores for wheelchair-confined individuals. Often, individuals who require the use of a wheelchair adopt different sitting postures and practices than those they exhibit during hospitalization. The result is often the development of pressure sores caused by sitting asymmetrically or from receiving pressure relief too infrequently. By utilizing a pressure mat on a wheelchair's seat that is connected to a computer, researchers are able to analyze the sitting practices and wheelchair use characteristics of disabled individuals over an extended period of time. This technology offers the promise of helping disabled people and their clinicians to reduce the likelihood and occurrence of sores due to wheelchair use.

Technology has also been used in an Ireland program whose goal was to utilize virtual reality systems. The goal of the program was to assist children who are confined to electric wheelchairs. Adaptive technologies such as electric wheelchairs have made significant inroads into removing the barriers attendant to disability. However, adaptive technology's operation and use in the clinical setting often falls short of truly replicating

the environment that an individual will enter upon being discharged from the hospital or rehabilitation provider.

To remedy this problem, Ireland's National Rehabilitation Board instituted a program to study the use of a training system for electric wheelchairs that takes advantage of virtual reality technology. Such a program promises to allow disabled children to adapt to their electronic wheelchairs through operating them in different environmental terrain such as a street environment and a shopping center. United States rehabilitation providers have increasingly turned to reality-based training facilities for rehabilitation patients. The refinement of virtual reality technology will give providers yet another treatment option.

Preventive Medicine to Lower the Incidence of Disability

European nations have not limited their technological endeavors to providing communication devices to improve the functioning of those with disabilities or to provide additional treatment options to enhance recovery from injury. New procedures and technological advancements have also been developed that offer the promise of significantly reducing the incidence of some types of disabilities. A prominent example of such a technological development is autologous chondrocyte implantation.

Autologous chondrocyte implantation was first introduced in experimental and clinical trials in Sweden. The treatment has subsequently been utilized in the United States with Brigham and Women's Hospital in Boston among the first providers to offer the procedure. The procedure is used for individuals who suffer cartilage damage in the knee and consequently must endure pain in the joint, swelling and catching and other impaired movement. When a defect in the cartilage exists, the body is not able to generate additional cartilage cells to correct the injury. Consequently, defects are subject to further wear and progressive damage over time. These injuries may lead to osteoarthritis, a painful condition that may often only be corrected by total knee replacement. Currently, the knee replacement option is a successful alternative for only ten to fifteen years before another replacement is needed.

An autologous chondrocyte implantation procedure begins with the harvesting of a small piece of cartilage tissue. The sample is then cultured for several weeks in which the cells multiply. The cells are then placed in conjunction with a type of fibrin glue, an autologous blood product, into the defect. Over time, the injected cells harden and the defect is repaired. A

successful procedure will reduce the likelihood and rapidity of developing osteoarthritis. In addition, the use of the patient's own cartilage cells and blood products significantly reduced the risk of immune system rejection of the repair. Such an advantage did not exist when donor bone was used to repair defects.

The technological advances described above are merely several of a host of contributions that European nations have contributed to the world-wide goal of providing rehabilitation to disabled individuals. Continued development and adaptation of new technologies for disabled individuals promise to provide increased prevention and treatment of disability worldwide. In addition, the refinement of adaptive technologies will enable the disabled and elderly to participate more fully in employment and cultural opportunities and services.

About the Author:

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This article can be found in the Rehab Management Magazine Fall 1999 Issue, or visit there website at www.rehabpub.com.