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RESEARCH ON PEOPLE WITH DISABILITIES AND ASSISTIVE TECHNOLOGY

COGNITIVE DISABILITIES

Assessing the benefits of using assistive technologies and other supports for thinking, remembering and learning.

Scherer MJ. Institute for Matching Person & Technology, Webster, New York 14580, USA. IMPT97@aol.com Disabil Rehabil. 2005 Jul 8;27(13):731-9.

PURPOSE: Planning assistive technologies and other supports for individuals with cognitive disabilities requires a comprehensive and individualized assessment of current goals, past experiences with the use of technologies and other supports, and the person's predisposition to the use of alternative or additional supports. This paper discusses a foundation for the refinement of an existing assessment process to match technologies to individuals with cognitive disabilities.

METHOD: Prior research and a literature review identified the critical needs for an assessment process that would serve to identify key elements known to influence the successful use of assistive technology and other supports by persons with cognitive disabilities.

RESULTS: The components of successful, effective and satisfied support use result from a good match of device and support features, user goals and preferences, and environmental resources. The relationship to the World Health Organization's International Classification of Functioning, Disability and Health and the International Standardization Organization's international standard ISO DIS 9999 is discussed.

CONCLUSIONS: As the number of assistive technology options increase, individualized interventions for individuals with cognitive disabilities will be easier to accomplish. The key to successful and optimal use of these products will be an appropriate and comprehensive assessment of consumer needs and preferences and the identification of additional accommodations and supports.

Distributed cognitive aid with scheduling and interactive task guidance.

Lopresti EF, Simpson RC, Kirsch N, Schreckenghost D, Hayashi S. AT Sciences, LLC, 160 N Craig St, Ste 117, Pittsburgh, PA 15213. edlopresti@at-sciences.com. J Rehabil Res Dev. 2008;45(4):505-22.

A cognitive assistive technology system has been designed for use by people with memory and organizational impairments. This system will provide a distributed architecture for both scheduling assistance and task guidance, as well as intelligent, automatic replanning on the levels of both the schedule and individual tasks. A prototype of this architecture has been developed that focuses on interactive task guidance capabilities. Scheduling software has been developed but not fully integrated with the

task guidance features. The system has been preliminarily tested through simulated trials, monitored use of the prototype in a clinical setting, and usability trials of the task-design interface with rehabilitation professionals. Participants were able to respond appropriately to cues provided by the system and complete prescribed tasks.

Improvement patterns among survivors of brain injury: three case examples documenting the effectiveness of memory compensation strategies.

Van Hulle A, Hux K. Barkley Memorial Center for Speech and Hearing, University of Nebraska-Lincoln, NE 68506, USA. Brain Inj. 2006 Jan;20(1):101-9.

Three case examples illustrate possible patterns of improved functioning that may emerge as survivors of traumatic brain injury (TBI) attempt compensation for persistent memory deficits impeding independent living. The task selected for report was independence in remembering to take regularly-prescribed medications. Strategies applied to promote learning included use of written reminders and use of two assistive technology (AT) devices—a wristwatch alarm (WatchMinder) and a digital voice recorder and alarm system (Voice Craft). With participation in the intervention programme, two of the three individuals demonstrated increased independence in remembering to take medications; the third did not. The case examples illustrate varying responses of people with TBI to intervention using compensatory strategies and AT devices. Professionals and caretakers working with survivors must recognize the uniqueness of each survivor, must adjust intervention programmes accordingly and must be willing to persist in trying to increase functional independence repeatedly for many years post-injury.

Indoor wayfinding: developing a functional interface for individuals with cognitive impairments.

Liu AL, Hile H, Kautz H, Borriello G, Brown PA, Harniss M, Johnson K. Department of Computer Science and Engineering, University of Washington, Seattle, WA 98195-2350, USA. Disabil Rehabil Assist Technol. 2008 Jan;3(1):69-81.

PURPOSE: Assistive technology for wayfinding will significantly improve the quality of life for many individuals with cognitive impairments. The user interface of such a system is as crucial as the underlying implementation and localisation technology. We studied the user interface of an indoor navigation system for individuals with cognitive impairments.

METHOD: We built a system using the Wizard-of-Oz technique that let us experiment with many guidance strategies and interface modalities. Through user studies, we evaluated various configurations of the user interface for accuracy of route completion, time to completion, and user preferences. We used a counter-balanced design that included different modalities (images, audio, and text) and different routes.

RESULTS: We found that although users were able to use all types of modalities to find their way indoors, they varied significantly in their preferred modalities. We also found that timing of directions requires careful attention, as does providing users with confirmation messages at appropriate times.

CONCLUSIONS: Our findings suggest that the ability to adapt indoor wayfinding devices for specific users' preferences and needs will be particularly important.

Perspectives on mobile robots as tools for child development and pediatric rehabilitation.

Michaud F, Salter T, Duquette A, Laplante JF. LABORIOUS-Research Laboratory on Mobile Robotics and Intelligent Systems, Department of Electrical Engineering and Computer Engineering, Université de Sherbrooke, Sherbrooke, Québec, Canada. francois.michaud@usherbrooke.ca Assist Technol. 2007 Spring;19(1):21-36.

Mobile robots (i.e., robots capable of translational movements) can be designed to become interesting tools for child development studies and pediatric rehabilitation. In this article, the authors present two of their projects that involve mobile robots interacting with children: One is a spherical robot deployed in a variety of contexts, and the other is mobile robots used as pedagogical tools for children with pervasive developmental disorders. Locomotion capability appears to be key in creating meaningful and sustained interactions with children: Intentional and purposeful motion is an implicit appealing factor in obtaining children's attention and engaging them in interaction and learning. Both of these projects started with robotic objectives but are revealed to be rich sources of interdisciplinary collaborations in the field of assistive technology. This article presents perspectives on how mobile robots can be designed to address the requirements of child-robot interactions and studies. The authors also argue that mobile robot technology can be a useful tool in rehabilitation engineering, reaching its full potential through strong collaborations between roboticists and pediatric specialists.

Technology for improving cognitive function. A workshop sponsored by the US Interagency Committee on Disability Research (ICDR): reports from working groups.

Bodine C, Scherer MJ. Assistive Technology Partners, Department of Physical Medicine and Rehabilitation, University of Colorado at Denver and Health Sciences Center, Denver, Colorado 80203, USA. cathy.bodine@uchsc.edu Disabil Rehabil. 2006 Dec 30;28(24):1567-71.

The U.S. federal Interagency Committee on Disability Research (ICDR) and its Subcommittee on Technology (IST) sponsored a state of the art workshop on "Technology for Improving Cognitive Function", from 29-30 June 2006 in Washington, D.C. This paper summarizes the content of the working groups charged with providing strategic direction for the future of technology for persons with cognitive disabilities.

COMMUNICATION DISABILITIES

Automatic speech recognition and training for severely dysarthric users of assistive technology: the STARDUST project.

Parker M, Cunningham S, Enderby P, Hawley M, Green P. Sheffield Speech and Language Therapy Agency, Sheffield, UK. Clin Linguist Phon. 2006 Apr-May;20(2-3):149-56.

The STARDUST project developed robust computer speech recognizers for use by eight people with severe dysarthria and concomitant physical disability to access assistive technologies. Independent computer speech recognizers trained with normal speech are of limited functional use by those with severe dysarthria due to limited and inconsistent proximity to "normal" articulatory patterns. Severe dysarthric output may also be characterized by a small mass of distinguishable phonetic tokens making the acoustic differentiation of target words difficult. Speaker dependent computer speech recognition

using Hidden Markov Models was achieved by the identification of robust phonetic elements within the individual speaker output patterns. A new system of speech training using computer generated visual and auditory feedback reduced the inconsistent production of key phonetic tokens over time.

Prescribing assistive-technology systems: focus on children with impaired communication.

Desch LW, Gaebler-Spira D; Council on Children With Disabilities. Collaborators (12) Murphy NA, Cartwright JD, Desch LW, DUBY JC, Elias ER, Liptak GS, Myers SM, Norwood KW Jr, Sagerman PJ, Tilton AH, Lipkin PH, Gaebler-Spira D. Pediatrics. 2008 Jun;121(6):1271-80.

This clinical report defines common terms of use and provides information on current practice, research, and limitations of assistive technology that can be used in systems for communication. The assessment process to determine the best devices for use with a particular child (ie, the best fit of a device) is also reviewed. The primary care pediatrician, as part of the medical home, plays an important role in the interdisciplinary effort to provide appropriate assistive technology and may be asked to make a referral for assessment or prescribe a particular device. This report provides resources to assist pediatricians in this role and reviews the interdisciplinary team functional evaluation using standardized assessments; the multiple funding opportunities available for obtaining devices and ways in which pediatricians can assist families with obtaining them; the training necessary to use these systems once the devices are procured; the follow-up evaluation to ensure that the systems are meeting their goals; and the leadership skills needed to advocate for this technology. The American Academy of Pediatrics acknowledges the need for key resources to be identified in the community and recognizes that these resources are a shared medical, educational, therapeutic, and family responsibility. Although this report primarily deals with assistive technology specific for communication impairments, many of the details in this report also can aid in the acquisition and use of other types of assistive technology.

A speech-controlled environmental control system for people with severe dysarthria.

Hawley MS, Enderby P, Green P, Cunningham S, Brownsell S, Carmichael J, Parker M, Hatzis A, O'Neill P, Palmer R. Department of Medical Physics and Clinical Engineering, Barnsley Hospital NHS Foundation Trust, UK. mark.hawley@nhs.net Med Eng Phys. 2007 Jun;29(5):586-93. Epub 2006 Oct 17.

Automatic speech recognition (ASR) can provide a rapid means of controlling electronic assistive technology. Off-the-shelf ASR systems function poorly for users with severe dysarthria because of the increased variability of their articulations. We have developed a limited vocabulary speaker dependent speech recognition application which has greater tolerance to variability of speech, coupled with a computerised training package which assists dysarthric speakers to improve the consistency of their vocalisations and provides more data for recogniser training. These applications, and their implementation as the interface for a speech-controlled environmental control system (ECS), are described. The results of field trials to evaluate the training program and the speech-controlled ECS are presented. The user-training phase increased the recognition rate from 88.5% to 95.4% ($p < 0.001$). Recognition rates were good for people with even the

most severe dysarthria in everyday usage in the home (mean word recognition rate 86.9%). Speech-controlled ECS were less accurate (mean task completion accuracy 78.6% versus 94.8%) but were faster to use than switch-scanning systems, even taking into account the need to repeat unsuccessful operations (mean task completion time 7.7s versus 16.9s, $p < 0.001$). It is concluded that a speech-controlled ECS is a viable alternative to switch-scanning systems for some people with severe dysarthria and would lead, in many cases, to more efficient control of the home.

Speech recognition software as an assistive device: a pilot study of user satisfaction and psychosocial impact.

Derosier R, Farber RS. Polisher Research Institute, Madlyn and Leonard Abramson Center for Jewish Life, 1425 Horsham Road, North Wales, PA 19454, USA. Work. 2005;25(2):125-34.

The purpose of this study was to gather data concerning the psychosocial (quality of life) impact of speech recognition software on individuals with physical disabilities and to identify how satisfied these individuals were with this software as a computer access method. Two standardized questionnaires, the Psychosocial Impact of Assistive Devices Scale (PIADS) and the Quebec User Evaluation of Satisfaction with assistive Technology (QUEST) were administered to ten participants with physical disabilities who received speech recognition software following an assistive technology evaluation. The results of this study indicated that 90% of the participants were quite satisfied with speech recognition software as an assistive device and that the software had a somewhat positive psychosocial impact on their lives. Four themes emerged concerning what the participants liked most about the software: 1) the software provided a method of access when they were not previously accessing a computer, 2) the software increased independence, 3) the software made computer use more efficient, and 4) the software provided a choice or flexibility in computer access. Although this study demonstrated that these speech recognition software users are generally satisfied with the software and it has had a positive impact on their life, it also suggests that there is a need to examine the role of training on satisfaction and successful use of the software.

COMMUNITY ORGANIZATIONS

Technology for independence: a community-based resource center.

Blanck P, Ritchie H, Schmeling J, Klein D. University of Iowa College of Law, Iowa City, IA 52242-1113, USA. peter-blanck@uiowa.edu Behav Sci Law. 2003;21(1):51-62. Despite the prominence of the disability civil rights model--with its values of inclusion and empowerment--the majority of social and policy research conducted to date has not sufficiently included the perspective of persons with disabilities in the research process and as uniquely qualified researchers themselves. This article describes a new project, "Technology for Independence: A Community-Based Resource Center" (CBRC). Over a five-year period, the CBRC will attempt to enhance community and consumer-directed disability organizations to design, implement, and disseminate research that promotes access to and use of assistive technology (AT). The CBRC will use strategies such as leadership training, participatory action research, technical assistance, web-assisted training, and annual symposia. A primary goal of the CBRC is to increase the capacity of

community organizations to conduct research on AT that is scientifically rigorous and relevant to disability services, policy, and law.

COMPUTERS

Accessibility compliance rates of consumer-oriented Canadian health care Web sites.

O'Grady L. Ontario Institute for Studies in Education, University of Toronto, Toronto, Canada. logrady@oise.utoronto.ca Med Inform Internet Med. 2005 Dec;30(4):287-95. Vast amounts of consumer-based health care information are widely available on the World Wide Web. However, for some this material is inaccessible due to reliance on specialized computer equipment or software known as assistive technology. These tools, designed for people with sensory, physical, or learning disabilities, act as a median to interpret Web pages in accessible ways. Unfortunately, many websites, including those with health-related content are not designed to accommodate this equipment. No research has yet been published examining the extent of this problem in Canadian consumer-oriented health care sites. The purpose of this study was to investigate the percentage of accessible consumer-based health care websites of Canadian origin. A listing of such sites was randomly sampled for study inclusion. Each was assessed for accessibility based on the World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI) Web Content Accessibility Guidelines (WCAG) 1.0 using the validation software Bobby. The results indicated that only about 40% of pages investigated were free of errors in accordance with WCAG 1.0 Priority 1 level. Websites should be constructed in compliance with these standards to better accommodate those using assistive devices.

Computer-related assistive technology: satisfaction and experiences among users with disabilities.

Burton M, Nieuwenhuijsen ER, Epstein MJ. Department of Physical Medicine and Rehabilitation, University of Michigan Hospitals and Health System, Ann Arbor, MI 48108-5744, USA. Assist Technol. 2008 Summer;20(2):99-106; quiz 84-5. Many people with disabilities use assistive technology devices (ATDs) for computer access. The specific focus of this exploratory study was (a) to assess the experiences, opinions, and satisfaction levels of 24 individuals with disabilities using computer-related ATDs; (b) to investigate their awareness of health risk factors related to computer usage; and (c) to examine the psychosocial impact of computer-related ATDs on users. Data were collected via telephone interviews with 24 individuals with physical disabilities who had experience using one or more ATDs. The Quebec User Evaluation with Assistive Technology instrument was used to evaluate users' satisfaction with ATDs in a number of dimensions, including their physical attributes. The Psychosocial Impact of Assistive Devices Scale measured the psychosocial impact (i.e., independence, competence, and adequacy) of an ATD on users. Additional questions were posed to gather information about user's opinions and experiences. Training appeared to be an important component for ATD users, many of whom preferred a setting to try out devices rather than group or individual training. Respondents with visual impairments revealed a higher level of

adaptability versus those without visual impairments ($p = .001$). Additional research is needed to develop specific survey items focused on users of computer-related ATDs and the evaluation of the psychosocial impact of ATDs on computer users.

EDUCATION

Consequential validity of an assistive technology supplement for the School Function Assessment.

Silverman MK, Smith RO. CESA #1, Milwaukee, Wisconsin 53211, USA. Assist Technol. 2006 Fall;18(2):155-65.

Educators and therapists implement assistive technology to maximize educational outcomes of students with disabilities. However, few measure the outcomes of interventions because of a lack of valid measurement tools. This study investigated whether an assistive technology supplement for the School Function Assessment demonstrates an important aspect of construct validity. Specifically, the study examined a type of consequential validity. Twenty-eight school-based therapists participated in the study. Two t tests compared a group using the School Function Assessment ($n = 13$) to a group using the assistive technology supplement to the School Function Assessment ($n = 15$). The first t test examined the difference in confidence therapists perceived in their ability to develop assistive technology interpretations. The second t test compared the number of assistive technology interpretations matching those of an expert panel. The first t test did not achieve significance ($p = .998$). The second t test achieved significance ($p = .001$). These results suggest, with certain limitations, that the assistive technology supplement for the School Function Assessment exhibits this important aspect of construct validity.

EMPLOYMENT

Assistive technology and computer adaptations for individuals with spinal cord injury.

McKinley W, Tewksbury MA, Sitter P, Reed J, Floyd S. Department of Physical Medicine and Rehabilitation, Virginia Commonwealth University, Richmond, VA, USA. wmckinle@hsc.vcu.edu NeuroRehabilitation. 2004;19(2):141-6.

Spinal cord injury (SCI) commonly occurs in individuals during important years for formation of vocational goals, resulting in low post-injury employment rates and higher costs to society. Individuals with SCI who are employed have improved quality of life. Assistive technology, often available at modest cost, can help individuals with SCI to compensate for functional limitations, overcome barriers to employability, enhance technical capacities and computer utilization, and improve ability to compete for gainful employment.

Assistive technology and employment: experiences of Californians with disabilities.

Yeager P, Kaye HS, Reed M, Doe TM. California Foundation for Independent Living Centers, Sacramento, CA, USA. patricia.yeager@unco.edu Work. 2006;27(4):333-44.

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For people with disabilities, work remains the best route to independence and enacting one's own choices. Assistive technology (AT) is often crucial in removing barriers to employment, and in enabling workers with disabilities to work more productively. A participatory action research project known as Community Research for Assistive Technology surveyed people with disabilities using Independent Living Centers throughout California, in part to identify barriers to employment and study use of job-related AT to overcome such barriers. Across disability groups, disability itself was cited as the primary barrier to employment, with potential loss of benefits and lack of education cited as secondary barriers. A majority of working respondents reported using assistive technology (such as adapted telephones, wheelchairs, magnifiers, and adapted computer equipment) or services to perform job functions. The vast majority of those using job-related AT reported substantial benefits to their productivity and self-esteem. Employees' requests for AT as a workplace accommodation were granted more often than not, but many other employees had to pay for their own workplace AT.

Assistive technology outcomes in work settings.

Schwanke TD, Smith RO. Rehabilitation Research Design and Disability (R2 D2) Center, University of Wisconsin-Milwaukee, USA. Work. 2005;24(2):195-204. Successfully documenting the outcomes of assistive technology (AT) interventions in the workplace benefits people with disabilities, service providers and agencies. However, no work related system currently exists that comprehensively collects the data needed to analyze such outcomes. Part of the reason for this absence of an outcome system is that, while the concept is simple, the process is complex and depends on the acquisition of data that represent many outcomes related variables. This article describes the exploratory work of the NIDRR (National Institute on Disability and Rehabilitation Research) funded ATOMS Project (Assistive Technology Outcomes Measurement System) and its efforts to identify existing data that might be used as the basis for an outcomes measurement system. Sample records from four assistive technology service programs were acquired and evaluated for the data they housed. This study discovered that AT service programs fail to collect consistent or sufficient data for outcomes analysis. However, discussions with AT programs that provided services to State vocational rehabilitation agencies revealed an interesting potential. Assistive technology service data in combination with data collected by State vocational rehabilitation departments might coalesce the needed data. The Federal Rehabilitation Services Administration (RSA) 911 Report aggregates many variables of outcomes related information including employment status and the success of the vocational rehabilitation investment. This combined database could answer a range of assistive technology outcomes related questions of interest to service providers, people with disabilities, and vocational rehabilitation State agencies. This paper describes the data needed in an outcomes system, reviews the data that appear to be available today related to AT outcomes, and projects how data from two diverse programs might be used together to create a significant outcomes database.

Employment issues and assistive technology use for persons with spinal cord injury.

Hedrick B, Pape TL, Heinemann AW, Ruddell JL, Reis J. University of Illinois at Urbana-Champaign, Urbana-Champaign, IL 61820, USA. J Rehabil Res Dev. 2006 Mar-Apr;43(2):185-98.

In this study, we examined associations between assistive technology (AT) cost, underwriting, ownership, use, employment, and employer accommodations for two groups (civilian and veteran) of working age adults (18-64 yr) with spinal cord injury or dysfunction (SCI/D). The project included the development of a survey instrument, and initial findings indicate that AT is important for the employment success of individuals with SCI/D. The majority of the AT devices owned by the respondents were characterized as important to work, and these devices were 3.5 times more expensive. The mean cost of assistive devices was 68% to 124% greater for persons who were self-employed compared with persons employed by others. Education was related to employment status for both groups. In addition, satisfaction with assistive devices was very high regardless of employment status or history.

A framework for providing telecommuting as a reasonable accommodation: some considerations on a comparative case study.

Kaplan S, Weiss S, Moon NW, Baker P. Center for Assistive Technology and Environmental Access, Georgia Institute of Technology, Atlanta, GA 30318, USA. shelley.kaplan@coa.gatech.edu Work. 2006;27(4):431-40.

Telecommuting, whether full time, part time, or over short periods when the need arises, can be an important accommodation for employees with disabilities. Indeed, telecommuting may be the only form of accommodation that offers employees whose disabilities fluctuate a means to stay consistently and gainfully employed. This article describes one employer's experience in considering a request for telecommuting as a reasonable accommodation for a particular employee. Drawing on real-life examples, both positive and negative, this article provides a win/win framework for decision-making that can help employers evaluate the use of telecommuting as a possible accommodation and facilitates open and ongoing communication between employer and employee.

Informed decision making on assistive technology workplace accommodations for people with visual impairments.

Gamble MJ, Dowler DL, Hirsh AE. Job Accommodation Network, West Virginia University, Morgantown, West Virginia, USA. Work. 2004;23(2):123-30.

Underemployment of people with visual impairments is an important problem in the world of work. Barriers to successful employment include the lack of informed decision making concerning AT as a workplace accommodation. Choosing effective Assistive Technology (AT) as an accommodation solution is imperative to successful employment of individuals with vision impairments. While not all jobs require AT as a part of an accommodation, when AT is needed, an informed choice is the best approach. This article describes the five step process for selecting appropriate AT for individuals with vision impairments in workplace accommodations developed by the Job Accommodation Network (JAN). Cases from the JAN database that involve people with vision impairments were examined. Resources to enable readers to further evaluate and implement effective AT solutions are provided.

User needs evaluation of workplace accommodations.

Williams M, Sabata D, Zolna J. Center for Assistive Technology and Environmental Access, Georgia Institute of Technology, Atlanta, GA 30318, USA.
mike.williams2@med.va.gov Work. 2006;27(4):355-62.

This study examined the multi-faceted issues surrounding workplace accommodation for workers with disabilities. A user needs survey of 510 disabled individuals examined the types of technology and accommodations needed to perform work and employment-related activities. Workers with disabilities used a variety of workplace accommodations to overcome difficulties with functional limitations. Some differences existed in the types of accommodations used by older and younger workers who had the same functional limitation. Workers of all ages were not likely to report mental limitations, and those who did were not likely to utilize workplace accommodations, with the exception of some memory strategies. For those with hearing loss, younger workers used sign language more frequently, while pre-retirement and retirement age workers used more hearing aids. Working age adults with vision impairments used electronic documents, Braille, and CCTVs more than pre-retirement or retirement age workers. Regardless of age, workers reporting functional limitations often received no workplace accommodations.

FUNDING

Assistive technology in medicaid home- and community-based waiver programs.

Kitchener M, Ng T, Lee HY, Harrington C. Department of Social and Behavioral Sciences, University of California, San Francisco, 3333 California Street, Suite 455, San Francisco, CA 94118, USA. Gerontologist. 2008 Apr;48(2):181-9.

PURPOSE: As consensus emerges concerning the need to extend publicly funded home- and community-based services that support the independence of seniors, studies have reported the efficacy and cost effectiveness of assistive technology (AT). This article presents the latest available national AT expenditure and participation trends (1999-2002) for Medicaid 1915(c) waivers, the largest Medicaid home- and community-based service program.

DESIGN AND METHODS: We collected annually reported Centers for Medicare and Medicaid Form 372 data from state officials for each waiver providing AT for the period from 1999 to 2002. Descriptive statistics examined trends in national participation and expenditures, interstate variations in participation and expenditures, and differences in provision between elderly persons and persons with developmental disabilities.

RESULTS: Although we report a rise in the number of waivers providing AT, there has been much slower participant growth compared with the broader waiver program, and there is wide interstate variation in waiver AT provision. Not only do most waivers with AT serve persons with developmental disabilities, AT spending for that target group is almost twice that for aged or disabled waiver participants.

IMPLICATIONS: This study highlights three policy concerns: first, the large interstate variations in AT provision in Medicaid waivers may signal access problems in some states; second, policy choices in some states may favor Medicaid spending on AT for the developmental disability population over that for the elderly population; and third, data limitations prevent a comparable state-by-state analysis of Medicare AT provision.

Funding, ethics, and assistive technology: should medical necessity be the criterion by which wheeled mobility equipment is justified?

Canning B. Wheelchair and Seating Clinic, Rehabilitation Institute of Chicago, Chicago, Illinois, USA. Top Stroke Rehabil. 2005 Summer;12(3):77-81.

The article will explore the use of the term medical necessity as it relates to wheeled mobility. Health insurance will cover a wheelchair if it is determined that it is medically necessary for a particular client. There are many different types of health insurance, and no universal definition of medical necessity. This presents a problem for clients and for individuals who are making wheelchair recommendations for clients. Case studies describe how equipment is currently recommended based on the limitations of the client's insurance coverage. As more equipment becomes available to improve the quality of life for people with disabilities, it will become harder for therapists recommending equipment to determine the limits of medical necessity.

Power mobility device provision: understanding Medicare guidelines and advocating for clients.

Dicianno BE, Tovey E. Department of Physical Medicine and Rehabilitation Institute for Rehabilitation and Research and Center for Assistive Technology, University of Pittsburgh Medical Center, Pittsburgh, PA, USA. diciannob@herlpitt.org Arch Phys Med Rehabil. 2007 Jun;88(6):807-16.

The Centers for Medicare and Medicaid (CMS) issued a new national coverage determination (NCD) for mobility assistive equipment (MAE) including wheelchairs in May 2005. CMS then issued a Final Rule in April 2006 that outlined significant changes required for documentation for prescribing MAE. Other insurance providers have since adopted and sometimes modified the NCD criteria and have begun to apply these criteria according to their own interpretations because some of the criteria are vague. In this report, we introduce a case example to show the components of the CMS NCD criteria, what was intended but poorly described in the language, how insurance providers may misinterpret or alter the criteria, and how clinicians can act as advocates.

Sources of payment for assistive technology: findings from a national survey of persons with disabilities.

Carlson D, Ehrlich N. US Department of Education, National Institute on Disability and Rehabilitation Research, Washington, DC 20202-2700, USA. Assist Technol. 2006 Spring;18(1):77-86.

This article provides an overview of who pays for the most commonly used assistive technology devices, special adaptations, and environmental accommodations by persons with disabilities in the United States. The latest findings from the 2001 survey of Use and Need of Assistive Technology and Information Technology by Persons With Disabilities in the United States conducted by the National Institute on Disability and Rehabilitation Research, Rehabilitation Engineering and Assistive Technology Society of North America, and the University of Michigan will be presented and compared to findings from earlier research and reviews of the literature. A modified discriminant function analysis was performed to determine the interaction between the source of payment for assistive technology used by persons with disabilities. In the sample of 1,414 such persons, 901 were found to use some form of assistive technology in their daily lives. Ten distinct sources of payment were specified. Respondents were able to

mention up to three sources of payment for each example of assistive technology used. A total of 1,877 sources were mentioned. Overall, the most mentioned payment source was self or other family member in household, accounting for nearly 40% of all sources mentioned. The variables tested were found to have varying levels of interactive potency. Occupational status, education level, severity of impairment, opinion as to the effectiveness of assistive technology, and personal income were significant, whereas age, family income, opinion as to improvement over the past decade, and race were statistically unrelated to source of payment. From the perspective of relative discrimination on the basis of payment source, Medicare stands as the lone significant discriminant source of payment. The authors offer a summary and conclusion based on an integrated view of all available sources of information about payment.

Wheelchairs, walkers, and canes: what does Medicare pay for, and who benefits?

Wolff JL, Agree EM, Kasper JD. Department of Health Policy and Management and Lipitz Center for Integrated Health Care, Johns Hopkins Bloomberg School of Public Health, in Baltimore, Maryland, USA. jwolff@jhsph.edu Health Aff (Millwood). 2005 Jul-Aug;24(4):1140-9.

Medicare's role in the distribution of mobility-related assistive technology has not been well documented, yet rapid growth and regional variation in spending, and concerns over "in-the-home" coverage criteria, highlight the need for facts. Using the 2001 Medicare Current Beneficiary Survey, we find that 6.2 percent percent of beneficiaries obtained mobility assistive technology under the Medicare durable medical equipment (DME) benefit. These beneficiaries were disproportionately poor, disabled, and users of both acute and postacute services. Average per item spending ranged from \$52 for canes to \$6,208 for power wheelchairs. Among beneficiaries who acquired such technology through the DME benefit, these devices comprised just 2 percent of overall Medicare spending.

INDEPENDENT LIVING (ELDERLY)

An intelligent emergency response system: preliminary development and testing of automated fall detection.

Lee T, Mihailidis A. Intelligent Assistive Technology and Systems Laboratory, Department of Occupational Therapy, University of Toronto, Canada. J Telemed Telecare. 2005;11(4):194-8.

We have designed an intelligent emergency response system to detect falls in the home. It uses image-based sensors. A pilot study was conducted using 21 subjects to evaluate the efficacy and performance of the fall-detection component of the system. Trials were conducted in a mock-up bedroom setting, with a bed, a chair and other typical bedroom furnishings. A small digital videocamera was installed in the ceiling at a height of approximately 2.6 m. The digital camera covered an area of approximately 5.0 m x 3.8 m. The subjects were asked to assume a series of postures, namely walking/standing, sitting/lying down in an inactive zone, stooping, lying down in a 'stretched' position, and lying down in a 'tucked' position. These five scenarios were repeated three times by each subject in a random order. These test positions totalled 315 tasks with 126 fall-

simulated tasks and 189 non-fall-simulated tasks. The system detected a fall on 77% of occasions and missed a fall on 23%. False alarms occurred on only 5% of occasions. The results encourage the potential use of a vision-based system to provide safety and security in the homes of the elderly.

Does assistive technology substitute for personal assistance among the disabled elderly?

Hoening H, Taylor DH Jr, Sloan FA. Department of Medicine/Geriatrics, Duke University Medical Center, Durham, NC, USA. helen.hoening@duke.edu Am J Public Health. 2003 Feb;93(2):330-7.

OBJECTIVES: This study examined whether use of equipment (technological assistance) to cope with disability was associated with use of fewer hours of help from another person (personal assistance).

METHODS: In a cross-sectional study of 2368 community dwellers older than 65 years with 1 or more limitations in basic activities of daily living (ADLs) from the 1994 National Long Term Care Survey, the relation between technological assistance and personal assistance was examined.

RESULTS: Among people with ADL limitations, multivariate models showed a strong and consistent relation between technological assistance and personal assistance, whereby use of equipment was associated with fewer hours of help.

CONCLUSIONS: Among people with disability, use of assistive technology was associated with use of fewer hours of personal assistance.

Managing activity difficulties at home: a survey of Medicare beneficiaries.

Dudgeon BJ, Hoffman JM, Ciol MA, Shumway-Cook A, Yorkston KM, Chan L. Department of Rehabilitation Medicine, University of Washington, Seattle, WA 98195-6490, USA. dudgeonb@u.washington.edu. Arch Phys Med Rehabil. 2008 Jul;89(7):1256-61. Epub 2008 Jun 13.

OBJECTIVE: To describe assistance from helpers and use of assistive technology and environmental modification by community-dwelling people with difficulties in activities of daily living (ADLs) and instrumental activities of daily living (IADLs).

DESIGN: Cross-sectional study using the 2004 Medicare Current Beneficiary Survey.

SETTING: Community.

PARTICIPANTS: Nationally representative sample of 14,500 Medicare beneficiaries (mean age, 71.5 y; 55% female; 49% currently married; 68% living with others; 84% white).

INTERVENTIONS: Not applicable.

MAIN OUTCOME MEASURES: Self-reported difficulty with ADLs and IADLs; uses of help, assistive technology, and/or environmental modification.

RESULTS: Difficulties were reported most frequently for heavy housework, walking, and shopping; money management, shopping, and light housework were reported as activities most often needing a helper. Walking, bathing, and toileting were activities most often needing uses of assistive technology. Bathroom modifications were the most commonly reported environmental modification. Results from a logistic regression showed that advancing age was the primary factor associated with increasing use of helpers and assistive technology or both for difficult activities.

CONCLUSIONS: Uses of helpers, assistive technology, and environmental modification are common but vary by type of ADL and/or IADL and age. Focused studies regarding uses of help and access to assistive technology and environmental modification appear needed to support community living. Public education about methods and types of accommodations appears needed and may substitute for or augment guidance from care providers.

A planning system based on Markov decision processes to guide people with dementia through activities of daily living.

Boger J, Hoey J, Poupart P, Boutilier C, Fernie G, Mihailidis A. Intelligent Assistive Technology and Systems Laboratory, Department of Occupational Science and Occupational Therapy, University of Toronto, Toronto, ON M5G 1V7, Canada.

jen.boger@utoronto.ca IEEE Trans Inf Technol Biomed. 2006 Apr;10(2):323-33.

Older adults with dementia often cannot remember how to complete activities of daily living and require a caregiver to aid them through the steps involved. The use of a computerized guidance system could potentially reduce the reliance on a caregiver. This paper examines the design and preliminary evaluation of a planning system that uses Markov decision processes (MDPs) to determine when and how to provide prompts to a user with dementia for guidance through the activity of handwashing. Results from the study suggest that MDPs can be applied effectively to this type of guidance problem. Considerations for the development of future guidance systems are presented.

Reconsidering substitution in long-term care: when does assistive technology take the place of personal care?

Agree EM, Freedman VA, Cornman JC, Wolf DA, Marcotte JE. Department of Population and Family Health Sciences, 615 North Wolfe Street, Room E4646, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD 21205, USA.

eagree@jhsph.edu J Gerontol B Psychol Sci Soc Sci. 2005 Sep;60(5):S272-80.

OBJECTIVE: Assistive technology (AT) may improve quality of life and reduce dependence for older persons with disabilities. In this article, we examine tradeoffs between the use of AT and reliance on personal care, with attention to factors that may influence those relationships.

METHODS: We jointly modeled hours of formal and informal care with use of AT in order to address the interdependence of these outcomes in ways not taken into account in previous studies. We analyzed a national sample of older persons with difficulty in activities of daily living drawn from Phase 2 of the 1994-1995 National Health Interview Survey (NHIS) Disability Supplement.

RESULTS: Our findings show that the use of AT was associated with reductions in informal care hours, especially for those who were unmarried, better educated, or had better cognitive abilities, but appeared to supplement formal care services for these groups. Individuals with cognitive impairment were less likely than others to substitute AT with either type of personal care.

DISCUSSION: These models raise the possibility that reductions of informal care hours may be accomplished with a combination of formal care and assistive devices, rather than from either alternative alone.

Trends in the use of assistive technology and personal care for late-life disability, 1992-2001.

Freedman VA, Agree EM, Martin LG, Cornman JC. Department Health Systems and Policy, School of Public Health, University of Medicine and Dentistry of New Jersey, 335 George Street, Suite 2200, New Brunswick, NJ 08903, USA. vfreedman@umdnj.edu
Gerontologist. 2006 Feb;46(1):124-7.

We describe national trends during the 1990s in late-life difficulty and assistance with self-care activities. Among older Americans living in the community and experiencing difficulty with self-care activities, assistive-technology use increased substantially whereas use of personal care declined. Using a decomposition technique, we demonstrate that these shifts in assistance toward technology account for half the decline in the number of people dependent on personal care.

INFORMATION SOURCES

Sources of information about how to obtain assistive technology: findings from a national survey of persons with disabilities.

Ehrlich NJ, Carlson D, Bailey N. Office of Survey Research, Institute for Public Policy and Social Research, Michigan State University, East Lansing, Michigan 48824, USA.
Assist Technol. 2003 Summer;15(1):28-38.

A modified discriminant function analysis was performed to determine the interaction between the source of information for assistive technology used by persons with disabilities. In the sample of 1,412 such persons, 901 were found to use some form of assistive technology in their daily lives. Ten distinct sources of information were specified. Respondents were able to mention up to three sources of information for each example of assistive technology used. A total of 930 sources were mentioned. Overall, the most mentioned information source was a physician or other health care professional, accounting for 53% of all sources mentioned. The only other frequently mentioned sources were family and friends (15%) and vocational rehabilitation counselors (13%). We found that physicians and health care professionals provide information to all groups without significant variance--this source of information is clearly nondiscriminant. Respondents who use family and friends as a source of information tend to be older, poorer, unemployed, more severely impaired, non-White, and, most significantly, render a more negative opinion of the amount and utility of information they have received about assistive technology, as well as the helpfulness of assistive technology in general. Persons obtaining information from vocational rehabilitation counselors tend to be better educated, non-White, unemployed, and have a more positive opinion about assistive technology. The limited size of the national population-based sample ($n = 1,412$) and very low number of responses indicating a state-based agency as the source of information about assistive technology did not allow state-by-state comparisons; alternative approaches, however, suggest a slight decline in the usage of the primary source (physician or other health care professional) with decreasing population, and a larger increase in the usage of family and friends as a source of information.

PERCEPTIONS OF ASSISTIVE TECHNOLOGY

Users' perceptions of the impact of electronic aids to daily living throughout the acquisition process.

Ripat J, Strock A. Department of Occupational Therapy, University of Manitoba, Winnipeg, Manitoba, Canada. Assist Technol. 2004 Summer;16(1):63-72.

This study investigated the experience of seven new users of a particular type of assistive technology through the stages of anticipating, acquiring, and using an electronic aid to daily living. A mixed methods research approach was used to explore each of these stages. The Psychosocial Impact of Assistive Devices Scale was used to measure the perceived impact of the new assistive technology on users' quality of life, and findings were further explored and developed through open-ended questioning of the participants. Results indicated that preacquisition of the device, users predicted that the electronic aid to daily living would have a positive impact on their feelings of competence and confidence and that the device would enable them in a positive way. One month after acquiring the device a reduced, yet still positive, impact was observed. By 3 and 6 months after acquisition, perceived impact returned to the same positive high level as preacquisition. It is suggested that prior to receiving the device, potential users have positive expectations for the device that are not based in experience. At the early acquisition time, users adjust expectations of the role of the assistive technology in their lives and strive to balance expectations with reality. Three to 6 months after acquiring an electronic aid to daily living, the participants have a high positive view of how the device impacts on their lives based in experience and reality. A model illustrating the electronic aids to daily living acquisition process is proposed, and suggestions for future study are provided.

PHYSICAL DISABILITIES

Accessible microscopy workstation for students and scientists with mobility impairments.

Duerstock BS. Department of Basic Medical Sciences, Center for Paralysis Research, Purdue University, West Lafayette, Indiana, USA. Assist Technol. 2006 Spring;18(1):34-45.

An integrated accessible microscopy workstation was designed and developed to allow persons with mobility impairments to control all aspects of light microscopy with minimal human assistance. This system, named AccessScope, is capable of performing brightfield and fluorescence microscopy, image analysis, and tissue morphometry requisite for undergraduate science courses to graduate-level research. An accessible microscope is necessary for students and scientists with mobility impairments to be able to use a microscope independently to better understand microscopical imaging concepts and cell biology. This knowledge is not always apparent by simply viewing a catalog of histological images. The ability to operate a microscope independently eliminates the need to hire an assistant or rely on a classmate and permits one to take practical laboratory examinations by oneself. Independent microscope handling is also crucial for graduate students and scientists with disabilities to perform scientific research. By

making a personal computer as the user interface for controlling AccessScope functions, different upper limb mobility impairments could be accommodated by using various computer input devices and assistive technology software. Participants with a range of upper limb mobility impairments evaluated the prototype microscopy workstation. They were able to control all microscopy functions including loading different slides without assistance.

Assessing the influence of wheelchair technology on perception of participation in spinal cord injury.

Chaves ES, Boninger ML, Cooper R, Fitzgerald SG, Gray DB, Cooper RA.

Department of Rehabilitation Science and Technology, University of Pittsburgh, PA, USA. Arch Phys Med Rehabil. 2004 Nov;85(11):1854-8.

OBJECTIVE: To investigate factors related to the wheelchair, impairment, and environment that affect perception of participation of persons with spinal cord injury (SCI) in activities performed in 3 settings: in the home, in the community, and during transportation.

DESIGN: Cross-sectional study.

SETTING: Research centers and a specialized assistive technology (AT) clinic in Pittsburgh (Pitt). Research centers and community-based rehabilitation technology suppliers in Saint Louis (SL).

PARTICIPANTS: Seventy wheelchair users with SCI. **INTERVENTIONS:** Subjects from Pitt and SL completed a written survey of AT usage in daily activities.

MAIN OUTCOME MEASURES: Subjects were asked 5 questions within each setting (home, community, transportation) related to their perceived reason for functional limitations.

RESULTS: The wheelchair was the most commonly cited factor limiting participation, followed by physical impairment and physical environment. Twenty-one percent of subjects with paraplegia reported pain as a limiting factor for their transportation use, significantly more ($P=.047$) than subjects with tetraplegia (3%). A trend ($P=.099$) was seen toward a higher percentage of subjects with tetraplegia (tetraplegia, 7%; paraplegia, 3%) reporting lack of equipment as a limiting factor for use of transportation. Differences were also seen across sites.

CONCLUSIONS: The wheelchair was the most commonly cited limiting factor, followed by physical impairment and physical environment. The wheelchair is the most important mobility device used by persons with SCI and the one that users most associate with barriers.

Bioengineering and spinal cord injury: a perspective on the state of the science.

Cooper RA. Department of Rehabilitation Science and Technology, University of Pittsburgh, Pittsburgh, Pennsylvania, USA. rcooper@pitt.edu J Spinal Cord Med. 2004;27(4):351-64.

There is little doubt that as technologic advances become available, people with spinal cord injuries (SCIs) are living healthier, more productive, and longer lives. Federally and privately funded research, foreign competition, and globalization appear to be factors that will drive bioengineering advances within the assistive technology (AT) industry. The seeds of bioengineering research are likely to contribute to improvements in universal design and the mainstreaming of products. The aims of AT have changed tremendously

in the past 50 years. Most of the federal agencies supporting assistive and rehabilitative technology research and development did not exist 50 years ago. Indeed, the leading AT companies all were established within the past 50 years. Bioengineering has the potential to be to the 21st century what electronic engineering was to the 20th century. Advances in power electronics, telecommunications, controls, sensors, and instrumentation have really only just begun to be applied for devices to assist people with SCI. Advancing technology for people with SCI represents a significant career and business opportunity for engineers who want to serve the public good in a meaningful and tangible way.

Computer access for people after stroke.

Hitchcock E. Technology Center, Rehabilitation Institute of Chicago, Illinois, USA. Top Stroke Rehabil. 2006 Summer;13(3):22-30.

This article will focus on computer access options for people who have had a stroke. The role of the occupational therapist and assistive technology specialist in evaluation, prescription, and training will be addressed. Options related to physical, perceptual, or cognitive impairments (following a stroke) to allow for access to the computer or to increase efficiency will be discussed. Alternative hardware, software options, and modifications to the operating system will be described.

Computer and internet use by persons after traumatic spinal cord injury.

Goodman N, Jette AM, Houlihan B, Williams S. Department of Public Health, Boston University, Boston, MA 02118, USA. naomirgoodman@yahoo.com Arch Phys Med Rehabil. 2008 Aug;89(8):1492-8.

OBJECTIVE: To determine whether computer and internet use by persons post spinal cord injury (SCI) is sufficiently prevalent and broad-based to consider using this technology as a long-term treatment modality for patients who have sustained SCI.

DESIGN: A multicenter cohort study.

SETTING: Twenty-six past and current U.S. regional Model Spinal Cord Injury Systems.

PARTICIPANTS: Patients with traumatic SCI (N=2926) with follow-up interviews between 2004 and 2006, conducted at 1 or 5 years postinjury.

INTERVENTIONS: Not applicable.

RESULTS: Results revealed that 69.2% of participants with SCI used a computer; 94.2% of computer users accessed the internet. Among computer users, 19.1% used assistive devices for computer access. Of the internet users, 68.6% went online 5 to 7 days a week. The most frequent use for internet was e-mail (90.5%) and shopping sites (65.8%), followed by health sites (61.1%). We found no statistically significant difference in computer use by sex or level of neurologic injury, and no difference in internet use by level of neurologic injury. Computer and internet access differed significantly by age, with use decreasing as age group increased. The highest computer and internet access rates were seen among participants injured before the age of 18. Computer and internet use varied by race: 76% of white compared with 46% of black subjects were computer users ($P<.001$), and 95.3% of white respondents who used computers used the internet, compared with 87.6% of black respondents ($P<.001$). Internet use increased with education level ($P<.001$): eighty-six percent of participants who did not graduate from high school or receive a degree used the internet, while over 97% of those with a college or associate's degree did.

CONCLUSIONS: While the internet holds considerable potential as a long-term treatment modality after SCI, limited access to the internet by those who are black, those injured after age 18, and those with less education does reduce its usefulness in the short term for these subgroups.

Computer-related assistive technology: satisfaction and experiences among users with disabilities.

Burton M, Nieuwenhuijsen ER, Epstein MJ. Department of Physical Medicine and Rehabilitation, University of Michigan Hospitals and Health System, Ann Arbor, MI 48108-5744, USA. Assist Technol. 2008 Summer;20(2):99-106; quiz 84-5. Many people with disabilities use assistive technology devices (ATDs) for computer access. The specific focus of this exploratory study was (a) to assess the experiences, opinions, and satisfaction levels of 24 individuals with disabilities using computer-related ATDs; (b) to investigate their awareness of health risk factors related to computer usage; and (c) to examine the psychosocial impact of computer-related ATDs on users. Data were collected via telephone interviews with 24 individuals with physical disabilities who had experience using one or more ATDs. The Quebec User Evaluation with Assistive Technology instrument was used to evaluate users' satisfaction with ATDs in a number of dimensions, including their physical attributes. The Psychosocial Impact of Assistive Devices Scale measured the psychosocial impact (i.e., independence, competence, and adequacy) of an ATD on users. Additional questions were posed to gather information about user's opinions and experiences. Training appeared to be an important component for ATD users, many of whom preferred a setting to try out devices rather than group or individual training. Respondents with visual impairments revealed a higher level of adaptability versus those without visual impairments ($p = .001$). Additional research is needed to develop specific survey items focused on users of computer-related ATDs and the evaluation of the psychosocial impact of ATDs on computer users.

Development of the new Family Impact of Assistive Technology Scale.

Ryan S, Campbell KA, Rigby P, Germon B, Chan B, Hubley D. Bloorview Research Institute, Bloorview Kids Rehab, Toronto, Ontario, Canada. sryan@bloorview.ca Int J Rehabil Res. 2006 Sep;29(3):195-200.

Children with physical disabilities generally require more care, attention and direct supervision than children without disabilities. Research demonstrates that these higher care-giving demands are associated with poorer psychological and physical health states for parents and other family members. Assistive technologies may have a role in mitigating caregiver stress and burden by improving functional performance, social interaction and autonomy in children with physical disabilities. In this paper, we report on the initial development and testing of the Family Impact of Assistive Technology Scale - a new measure designed to detect the multidimensional effect of assistive device use on families who have young children with disabilities. To study the content validity and face validity of the Family Impact of Assistive Technology Scale, we conducted structured evaluations of the proposed constructs and items with 14 clinical experts and parents of young children with cerebral palsy. Experts agreed that the Family Impact of Assistive Technology Scale contains the key variables needed to study the effect of assistive technology use on child and family functioning. Parents concurred that items on the preliminary version were relevant and clear. Further research is planned to estimate the

reliability and other aspects of validity of the Family Impact of Assistive Technology Scale.

PDAs as cognitive aids for people with multiple sclerosis.

Gentry T. Department of Occupational Therapy, Virginia Commonwealth University, Richmond, VA 23298-0008, USA. logentry@vcu.edu Am J Occup Ther. 2008 Jan-Feb;62(1):18-27.

OBJECTIVE: Cognitive impairment is a common symptom for people with multiple sclerosis (MS). This study evaluated the effects of an occupational therapy training protocol using personal digital assistants (PDAs) as assistive technology for people with cognitive impairment related to MS.

METHODS: Twenty participants were trained to use PDAs by an occupational therapist. Assessments of functional performance were taken at the start of an 8-week pretreatment period, at the beginning and end of training, and 8 weeks after the conclusion of training.

RESULTS: Participants demonstrated the ability to learn how to use basic PDA functions and retain learning for at least 8 weeks. Functional performance increased significantly with PDA use, and this gain was maintained at 8-week follow-up.

CONCLUSION: This study provides evidence of an association between an intervention providing training in the use of a PDA and improvements in the everyday function of people with cognitive impairment related to MS.

Powered mobility for middle-aged and older adults: systematic review of outcomes and appraisal of published evidence.

Auger C, Demers L, G elinas I, Jutai J, Fuhrer MJ, DeRuyter F. School of Rehabilitation, Universit e de Montr eal, Montr eal, Canada. Am J Phys Med Rehabil. 2008 Aug;87(8):666-80.

OBJECTIVE: To identify the outcomes of power mobility devices for middle-aged and older adult users, and to critically appraise the research evidence.

DESIGN: Systematic review of primary source studies involving adults aged 50 and over using power mobility devices (1996-2007). Articles were (i) mapped to the Taxonomy of Assistive Technology Device Outcomes, which describes categories of impact of assistive devices from the vantages of effectiveness, social significance, and subjective well-being; and (ii) appraised using the Grading of Recommendations, Assessment, Development, and Evaluation criteria.

RESULTS: This review retained 19 studies and identified 52 different categories of impacts of power mobility devices spanning the three vantages of the taxonomy. The coverage of outcome dimensions was not as extensive for adults age 50 and over as it was for mixed-age groups. Most of the research designs were assigned very low evidence grades. Three studies were low to moderate in quality of evidence, among which one was a randomized trial.

CONCLUSIONS: A vast array of potential impacts of powered mobility devices have been described in the last decade. The level of quality of this evidence is improving, but most of these studies were not designed to verify causal relationships, and this is largely responsible for the absence of unequivocal evidence for directly attributing benefits to devices themselves and for quantifying relationships between power mobility device intervention and outcome. To raise the level of evidence about power mobility device

interventions in older adults, studies are needed that use prospective designs, better-defined user groups, and well-grounded conceptual frameworks for measuring interventions and outcomes.

Powered tilt/recline systems: why and how are they used?

Lacoste M, Weiss-Lambrou R, Allard M, Dansereau J. Natural Sciences and Engineering Research Council of Canada (NSERC), Industrial Research Chair on Wheelchair Seating Aids, Ecole Polytechnique de Montréal, Montréal Quebec, Canada. Assist Technol. 2003 Summer;15(1):58-68.

Prolonged static sitting can lead to discomfort, pain, pressure sores, spinal curvatures, and loss of functional independence. In order to counteract these harmful effects, adjustable tilt and/or recline systems are often prescribed. Considering the current context of assistive technology service delivery and budget cuts, it is essential to have a better knowledge of the use of these technical aids and user's satisfaction with them. The purpose of this study was to characterize the use of powered tilt and recline systems. A questionnaire was developed for this purpose, and 40 subjects were interviewed at home. They were asked to identify, from a list of 25 objectives, the reasons for which they used their repositioning system and to rank these reasons in order of importance. For each objective, they were also asked to identify the frequency and range of use as well as their satisfaction level with their system. Results revealed that 97.5% of the subjects were using their powered tilt and recline system everyday, and their satisfaction was high. The main objectives for using this type of assistive technology were to increase comfort and to promote rest. Although mainly descriptive, results are of clinical relevance and can be helpful when selecting wheelchairs.

Technological advances in powered wheelchairs.

Edlich RF, Nelson KP, Foley ML, Buschbacher RM, Long WB, Ma EK. University of Virginia Health System, Charlottesville, Virginia, USA. J Long Term Eff Med Implants. 2004;14(2):107-30.

During the last 40 years, there have been revolutionary advances in power wheelchairs. These unique wheelchair systems, designed for the physically immobile patient, have become extremely diversified, allowing the user to achieve different positions, including tilt, recline, and, more recently, passive standing. Because of this wide diversity of powered wheelchair products, there is a growing realization of the need for certification of wheeled mobility suppliers. Legislation in Tennessee (Consumer Protection Act for Wheeled Mobility) passed in 2003 will ensure that wheeled mobility suppliers must have Assistive Technology Supplier certification and maintain their continuing education credits when fitting individuals in wheelchairs for long-term use. Fifteen other legislative efforts are currently underway in general assemblies throughout the US. Manufacturers, dealers, hospitals, and legislators are working toward the ultimate goal of passing federal legislation delineating the certification process of wheeled mobility suppliers. The most recent advance in the design of powered wheelchairs is the development of passive standing positions. The beneficial effects of passive standing have been documented by comprehensive scientific studies. These benefits include reduction of seating pressure, decreased bone demineralization, increased bladder pressure, enhanced orthostatic circulatory regulation, reduction in muscular tone, decrease in upper extremity muscle stress, and enhanced functional status in general. In February

2003, Permobil, Inc., introduced the powered Permobil Chairman 2K Stander wheelchair, which can tilt, recline, and stand. Other companies are now manufacturing powered wheelchairs that can achieve a passive standing position. These wheelchairs include the Chief SR Powerchair, VERTRAN, and LifeStand Compact. Another new addition to the wheelchair industry is the iBOT, which can elevate the user to reach cupboards and climb stairs but has no passive standing capabilities. In addition, the physically immobile patient must be seated on an ERGODYNAMIC Seating System 2000, which is inflated by the alternating pressure compressor 8080. This seating system has a deep center seam between the two ischial-support chambers, which provides a recess for the coccyx. The pre-ischial crossbar compartment inflates during each cycle to prevent the pelvis from slipping forward. It is essential that the physician of the immobile patient order two ERGODYNAMIC Seating Systems 2000 because the patient must have an additional seating system in the case one leaks. Moreover, two compressors are necessary because each compressor must be serviced after 2500 hours of use. For the protection of the consumer, these pressure relief systems must be supplied and serviced by a Certified Rehabilitation Technology Supplier such as Wheelchair Works Inc. Despite the indisputable scientific evidence of the medical benefits of passive standing for the immobile user, few individuals have access to these revolutionary wheelchairs. Consequently, it is mandatory that the medical community, headed by specialists in physical and occupational therapy as well as rehabilitation medicine, CRTS, and manufacturers collaborate in a national education campaign to convince Medicare/Medicaid and all commercial insurance companies to approve immediately these assisted technologies. This program is essential so that the physically immobilized patient can achieve the undisputed physical benefits of passive standing.

Tracking mobility-related assistive technology in an outcomes study.

Demers L, Fuhrer MJ, Jutai JW, Scherer MJ, Pervieux I, DeRuyter F. School of Rehabilitation, University of Montreal, Box 6128, succursale Centre-Ville, Montreal, Quebec, Canada. Assist Technol. 2008 Summer;20(2):73-83.

The objective of this follow-up study was to describe changes in the mobility-related assistive technology devices (ATDs) that are used from shortly after discharge from a hospital setting until 5-6 months later. One hundred and thirty-nine participants who had one or more mobility ATDs (canes, crutches, walkers, and wheelchairs) that had been recommended during hospitalization were interviewed an average of 5.5 weeks after discharge and an average of 23.2 weeks later. Information about mobility ATD usage was obtained by questionnaire during face-to-face interviews. The SF-36 was used to assess perceived health status, both physical and mental, as an additional outcome. Results show that at follow-up, only 23.3% of participants were using the ATD provided at baseline as their primary aid. Seven distinct groups of participants were noted based on individual experience with ATD use from the time of discharge to follow-up. Those groups varied according to continued versus discontinued use of an ATD, single versus multiple ATD use across time, and primary versus secondary importance attributed to the ATD. The groups also differed in terms of their differential association with rehabilitation diagnosis, age, as well as physical and mental perceived health status. The findings have implications for designing ATD outcome studies and for interpreting the relationship of ATD outcomes to other variables. The information about changes in mobility-related ATDs can also help rehabilitation specialists at the point of device

referral target their patients for interventions that will either increase their adherence to device prescriptions or support nondevice strategies for managing disabilities.

Trends and issues in wheelchair technologies.

Cooper RA, Cooper R, Boninger ML. Department of Rehabilitation Science & Technology, University of Pittsburgh, Pittsburgh, Pennsylvania, USA. Assist Technol. 2008 Summer;20(2):61-72.

There is an overwhelming need for wheelchairs and the research and development required to make them safer, more effective, and widely available. The following areas are of particular importance: practitioner credentials, accreditation, device evaluation, device user training, patient education, clinical prescribing criteria, national contracts, and access to new technology. There are over 170 U.S. wheelchair manufacturers with a total reported income of \$1.33 billion. However, of these companies, only five had sales in excess of \$100 million. Wheelchairs account for about 1% of Medicare spending. Use of assistive technology is an increasingly common way of adapting to a disability. The emergence of advanced mobility devices shows promise for the contribution of engineering to the amelioration of mobility impairments for millions of people who have disabilities or who are elderly. Some of the trends in wheelchairs are going to require new service delivery mechanisms, changes to public policy, and certainly greater coordination between consumers, policy makers, manufacturers, researchers, and service providers.

Virtual reality and computer-enhanced training applied to wheeled mobility: an overview of work in Pittsburgh.

Cooper RA, Ding D, Simpson R, Fitzgerald SG, Spaeth DM, Guo S, Koontz AM, Cooper R, Kim J, Boninger ML.

Department of Rehabilitation Science and Technology, University of Pittsburgh, Pittsburgh, Pennsylvania, USA. Assist Technol. 2005 Fall;17(2):159-70.

Some aspects of assistive technology can be enhanced by the application of virtual reality. Although virtual simulation offers a range of new possibilities, learning to navigate in a virtual environment is not equivalent to learning to navigate in the real world. Therefore, virtual reality simulation is advocated as a useful preparation for assessment and training within the physical environment. We are engaged in several efforts to develop virtual environments and devices for mobility skills assessment and training, exercise training, and environment assessment. Virtual reality offers wheelchair users a training tool in different risk-free environments without any indoor (e.g., walls, furniture, and stairs) and outdoor (e.g., curb cuts, uneven terrain, and street traffic) physical constraints. Virtual reality technology will probably become more common in the field of assistive technology, especially given the rapid expansion of gaming technology and the continued exponential growth of computing power.

The Vocal Joystick: evaluation of voice-based cursor control techniques for assistive technology.

Harada S, Landay JA, Malkin J, Li X, Bilmes JA. DUB Group, Computer Science and Engineering Department, University of Washington, Seattle, WA 98195, USA. harada@cs.washington.edu Disabil Rehabil Assist Technol. 2008 Jan;3(1):22-34.

PURPOSE: Mouse control has become a crucial aspect of many modern day computer interactions. This poses a challenge for individuals with motor impairments or those whose use of hands is restricted due to situational constraints. We present a system called the Vocal Joystick which allows the user to continuously control the mouse cursor by varying vocal parameters such as vowel quality, loudness and pitch.

METHOD: Evaluations were conducted to characterize expert performance capability of the Vocal Joystick, and to compare novice user performance and preference for the Vocal Joystick and two other existing speech based cursor control methods.

RESULTS: Our results show that Fitts' law, a well adopted model of human motor performance for movement tasks, is a good predictor of the speed - accuracy tradeoff for the Vocal Joystick, and suggests that the optimal performance of the Vocal Joystick may be comparable to that of a conventional hand-operated joystick. Novice user evaluations show that the Vocal Joystick can be used by people without extensive training, and that it presents a viable alternative to existing speech-based cursor control methods.

CONCLUSIONS: The Vocal Joystick, with its ease of use, minimal setup requirement, and controllability, offers promise for providing an efficient method for cursor control and other forms of continuous input for individuals with motor impairments.

The wheelchair procurement process: perspectives of clients and prescribers.

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bmortens@interchange.ubc.ca Can J Occup Ther. 2008 Jun;75(3):167-75.

BACKGROUND: Increasing choices in assistive technology have made the process of procuring a wheelchair more complex and challenging.

PURPOSE: To explore the intricacies of the procurement process from the perspectives of clients and therapists.

METHODS: Thirty-four participants were interviewed, including 13 wheelchair prescribers, 14 wheelchair users, and 7 wheelchair associates (family members and caregivers).

FINDINGS: Analysis revealed five main themes. "Who decides?" described varying degrees of client involvement in the procurement process. "Expert knowledge" reflected the expert knowledge that all parties possessed. "Form versus function" captured the primary and, at times, conflicting outcomes that participants wanted to achieve. "Fitting in" depicted the environmental factors that affected wheelchair procurement.

"(Re)solutions" illustrated strategies that participants felt improved the process.

IMPLICATIONS: This study reveals clients' experiences with wheelchair procurement, identifies potential issues therapists may encounter, and suggests possible remedies they might consider when prescribing wheelchairs within a client-centred framework.

SENSORY DISABILITIES

Clinical report: use of the Canadian Occupational Performance Measure in vision technology.

Petty LS, McArthur L, Treviranus J. Adaptive Technology Resource Centre, University of Toronto, ON. linda.petty@utoronto.ca Can J Occup Ther. 2005 Dec;72(5):309-12.

BACKGROUND: The Canadian Occupational Performance Measure (COPM) has gained wide acceptance in general occupational therapy research and practice,

however, the use of the COPM in assistive technology assessments and outcomes is not as well documented.

PURPOSE: This clinical report discusses the utility of the COPM in assistive technology, as illustrated by the assessment and follow-up of clients requiring high technology vision aids.

RESULTS: The COPM makes important contributions to the outcomes of providing vision aids. The COPM ensures a needs review that incorporates all areas of occupational performance, which in turn directs the clinician to match the technology to client needs. From a clinical perspective, the quantitative follow-up data are helpful to determine clients' improvement in occupational performance as well as their satisfaction with the assistive technology. For administrative purposes, the COPM results provides accountability to the funding agency.

PRACTICE IMPLICATIONS: The COPM can be readily integrated into the assessment and follow-up of assistive technology service delivery and adds value to both components of the process.

Evidence for the use of hearing assistive technology by adults: the role of the FM system.

Chisolm TH, Noe CM, McArdle R, Abrams H. University of South Florida, Tampa, Florida 33620, USA. tchisolm@cas.usf.edu Trends Amplif. 2007 Jun;11(2):73-89.

Hearing assistive technologies include listening, alerting, and/or signaling devices that use auditory, visual, and/or tactile modalities to augment communication and/or facilitate awareness of environmental sounds. The importance of hearing assistive technologies in the management of adults with hearing loss was recently acknowledged in an evidence-based clinical practice guideline developed by the American Academy of Audiology. Most currently available evidence for hearing assistive technology use by adults focuses on frequency-modulated (FM) technology. Previous research is reviewed that demonstrates the efficacy of FM devices for adults in terms of laboratory measures of speech understanding in noise. Also reviewed are the outcomes from field trials of FM use by community-dwelling adults, which, to date, have been disappointing. Few to no individuals, in previous studies, elected to use FM devices at the end of the trial periods. Data are presented from a 1-group pretest-posttest study examining the role of extensive counseling, coaching, and instruction on FM use by adults. In addition, the potential influence of the cost of devices to the individual was eliminated by conducting the study with veterans who were eligible to receive FM systems through the Veterans Affairs National Hearing Aid Program. Positive outcomes were obtained at the end of a 6-week trial period and were found to remain 1 year after study completion. Implications for increasing the evidence base for the use of FM devices by adults are discussed.

Hearing assistive technology considerations for older individuals with dual sensory loss.

Kricos PB. Department of Communication Sciences and Disorders, University of Florida, Gainesville, FL 32611-7420, USA. pkricos@csd.ufl.edu Trends Amplif. 2007 Dec;11(4):273-9.

This article focuses on the current state of the science related to audiologic rehabilitation of individuals with dual sensory impairment, with an emphasis on considerations for provision of appropriate hearing assistive technology for this population. A substantial

increase in the number of older adults is predicted in the coming years, many of whom will have significant age-related impairments in hearing and vision. Thus, hearing care professionals will be called on increasingly to attend to the special needs of people with dual sensory impairments to ensure maximal quality of life and independence for these individuals. Access to sound is critical for individuals who live with compromises in both vision and hearing. Hearing assistive technology may improve not only their speech perception but also their connection and orientation to the environment, as well as enable greater mobility. Thus, the audiologist's provision of appropriate and carefully selected hearing assistive technology may contribute dramatically to the quality of life of the individual with dual sensory loss. Prefitting, fitting, and postfitting considerations in providing hearing aids and other assistive technology to individuals with dual sensory impairment are reviewed.

Robot-assisted shopping for the visually impaired: proof-of-concept design and feasibility evaluation.

Kulyukin V, Gharpure C, Coster D. Computer Science Assistive Technology Laboratory, Department of Computer Science, Utah State University, Logan, Utah 84322-4205, USA. vladimir.kulyukin@usu.edu Assist Technol. 2008 Summer;20(2):86-98.

This article presents RoboCart, a proof-of-concept prototype of a robotic shopping cart for the visually impaired in supermarkets. RoboCart autonomously leads shoppers to required locations and cues them through synthetic speech and a portable barcode reader to the salient features of the environment sufficient for product retrieval. In a longitudinal pilot feasibility study, visually impaired shoppers (n = 10) used the device to retrieve products in Lee's MarketPlace, a supermarket in Logan, Utah. The main finding is that RoboCart enables visually impaired shoppers to reliably and independently navigate to and retrieve products in a real supermarket.

Rural gifted students who are deaf or hard of hearing: how electronic technology can help.

Belcastro FP. Northeast Iowa Community College, Peosta, USA. Am Ann Deaf. 2004 Fall;149(4):309-13.

Electronic technology can be used to overcome many of the barriers and other factors that restrict delivery of services to rural schools; it can also expand the world of rural gifted students who are deaf or hard of hearing. Online college and high school Web sites that offer courses are listed, as well as a Web site for tutoring and one offering help for teachers of rural gifted students who are deaf or hard of hearing. Recommendations are made for ways that legislatures and rural school districts can make Internet resources and assistive technology more widely available in rural educational settings.

Using virtual environments to prototype auditory navigation displays.

Walker BN, Lindsay J. Georgia Institute of Technology, Atlanta, Georgia, USA. Assist Technol. 2005 Spring;17(1):72-81.

There is a critical need for navigation and orientation aids for the visually impaired. Developing such displays is difficult and time consuming due to the lack of design tools and guidelines, the inefficiency of trial-and-error design, and experimental participant safety concerns. We discuss using a virtual environment (VE) to help in the design, evaluation, and iterative refinement of an auditory navigation system. We address

questions about the (real) interface that the VE version allows us to study. Examples include sound design, system behavior, and user interface design. Improved designs should result from a more systematic and scientific method of assistive technology development. We also point out some of the ongoing caveats that researchers in this field need to consider, especially relating to external validity and over-reliance on VE for design solutions.

TRAINING

Assistive technology curriculum structure and content in professional preparation service provider training programs.

Brady R, Long TM, Richards J, Vallin T. Department of Pediatrics, Center for Child and Human Development, Georgetown University, Washington, DC 20057-1485, USA. rab9@georgetown.edu J Allied Health. 2007 Winter;36(4):183-92.

Assistive technology (AT) and AT services enable children and youth with disabilities and special health care needs to participate in society and are increasingly a part of service provider practice. It is not clear how professional preparation programs are meeting the challenge of preparing service providers to provide AT/AT services. An electronic survey was sent to the program directors for occupational therapy, physical therapy, special education, and speech-language pathology programs in the United States (n = 959) to determine the extent to which AT/AT services were included in the curriculum. The results (n = 153) showed that nearly all of the programs that responded covered AT/AT services in their curriculum, used similar types of faculty and teaching method patterns, and were generally satisfied with the amount of time they spent on the subject. The programs differed, however, in terms of the time spent and emphasis of content specific to their program type. Gaps existed in the extent to which programs covered the influence of culture on the use of AT and addressing the requirement to discuss AT/AT services at every Individualized Education Program meeting. These gaps and emphasis on specific topics within program types indicate that service providers may leave programs with a narrow scope of knowledge about AT/AT services. Information from this survey suggests that to promote contemporary practice in the areas of AT/AT services, entry-level curricula should be enriched or expanded to comprehensively present AT information instruction in this growing service area.

Assistive technology: providing independence for individuals with disabilities.

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Despite improvements in technology and health care, the number of people with disabilities, and the complexity of needs that they and their families experience, continue to increase. In response to these needs, specialized technology has been developed that helps people with disabilities to become more independent and more involved in the activities in their homes, schools, and communities. However, many individuals with disabilities, their family members, and many rehabilitation service providers are not aware of the availability, use of, and benefits afforded by assistive technology devices. Further, many providers have not received the pre-service academic preparation

required to provide services and support to their clients. Preparation includes acquiring the knowledge and skills needed for evaluation of client needs, making appropriate assistive technology recommendations, and developing advocacy skills such as writing letters of necessity that justify funding for assistive technology devices. This article provides information about these issues and suggests that further information is available through continuing education courses as well as articles in the reference list and other sources cited in the accompanying tables.

Broadening opportunities for job seekers with disabilities: strategies to effectively provide assistive technology in One-Stop centers.

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The Workforce Investment Act (WIA) of 1998 mandates that partners in the One-Stop Career Center (One-Stop) system be prepared to serve a diverse customer base, including job seekers with disabilities. For many such individuals, effective service delivery depends in part on the existence of appropriate and efficient assistive technology (AT) options. This article presents challenges experienced by One-Stop partners related to AT provision as well as strategies for providing effective AT support. Findings from case study research conducted in several One-Stops across the country revealed three strategies that have enhanced employment services and addressed barriers. These are (a) an accurate assessment of AT needs, (b) staff training and practice using the equipment, and (c) the ability to make the most of limited financial resources. Implications for the most efficient ways to provide AT options are discussed.

Examining educators of the deaf as "highly qualified" teachers: roles and responsibilities under IDEA and NCLB.

Luft P. Kent State University, Kent, OH, USA. Am Ann Deaf. 2008 Winter;152(5):429-40.

Educators of the deaf were long considered "highly qualified" if they obtained state licensure from approved deaf education programs. But the No Child Left Behind Act (2001) redefined qualifications based on core academic content areas, without recognizing disability-specific expertise. NCLB's reauthorization will provide opportunities for examining definitions of "highly qualified" and ensuring that both general and special educators are appropriately prepared. Under the Individuals With Disabilities Education Act, educators of the deaf are primarily responsible for supporting implementation of each assigned student's individualized education program. When done skillfully and knowledgeably, IEP execution maximizes learning outcomes, and therefore would support NCLB mandates for improved student achievement. Instead of academic attainment alone, the primary "qualification" of educators of the deaf should be training and expertise in providing communication, learning, and assistive technology supports that allow access to academic content and, ultimately, address deaf students' historical underachievement.

Pediatric physical therapists' perceptions of their training in assistive technology.

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3300, Washington, DC 20057-1485, USA. longt@georgetown.edu Phys Ther. 2008 May;88(5):629-39. Epub 2008 Mar 6.

BACKGROUND AND PURPOSE: Availability of assistive technology (AT) and federal legislation promoting greater use of AT for children with disabilities have increased substantially. The purpose of this study was to determine the perceived adequacy of previous training in AT, specific training needs, preferred methods of training, and the confidence level of pediatric physical therapists in providing AT.

SUBJECTS AND METHODS: Three hundred eighty pediatric physical therapists responded to a survey questionnaire mailed to a random sample of members of the Section on Pediatrics of the American Physical Therapy Association. The survey was used to determine training needs of therapists in the area of AT, their confidence in delivering AT services, preferred methods of training, and challenges in becoming trained.

RESULTS: The therapists reported having less-than-adequate training in AT and a lack of confidence in delivering AT services. They also reported that they would like accessible and affordable training that focuses on funding technology and services, knowledge of specific devices, and assessment and evaluation methods.

DISCUSSION AND CONCLUSION: The findings underscore the need to develop pre-service, in-service, and continuing education training opportunities in AT for providers working with children who have disabilities.

Survey of state vocational rehabilitation counselor roles and competencies in assistive technology.

Noll A, Owens L, Smith RO, Schwanke T. Stout Vocational Rehabilitation Institute, University of Wisconsin-Stout, Menomonie, WI 54751, USA. nolla@uwstout.edu Work. 2006;27(4):413-9.

The delivery of assistive technology (AT) within the state and federal vocational rehabilitation systems in the United States has been developing and refining itself over the last twenty years. Many challenges have been confronted in an attempt to use this relatively new service to increase the employment options and success for individuals with disabilities. In this process, the rehabilitation counselor serves as a critical player in the planning and delivery of AT as it articulates with other rehabilitation services. This study investigated counselor views regarding their role and competence in providing AT services and devices to individuals with disabilities throughout the state of Wisconsin. The results of the survey indicated, in general, that counselors find AT to be a cost-effective service that can increase employment related outcomes. As with other service areas, the counselors' role in AT service delivery involves coordinating, purchasing and following up on services. Interestingly, while counselors expressed confidence in performing these overall functions, they reported a lack of confidence in identifying the need for AT services. Without a comfort level to make this determination, benefits from the implementation of AT may be quite limited. Results suggest that intervention is needed to improve counselors' abilities to make decisions regarding AT services.

Training needs of pediatric occupational therapists in assistive technology.

Long TM, Woolverton M, Perry DF, Thomas MJ. Division of Physical Therapy, Georgetown University, Center for Child and Human Development, 3300 Whitehaven

Parkway NW, Washington, DC 20007, USA. longt@georgetown.edu Am J Occup Ther. 2007 May-Jun;61(3):345-54.

The training of providers working with children who need assistive technology devices or services has not kept pace with the explosion of new, more sophisticated assistive technology devices now available. This article reports on a national survey of 272 pediatric occupational therapists, who responded to questions about their training needs in the area of assistive technology and delivering assistive technology services. A sizable percentage of these therapists reported less-than-adequate training in policies governing assistive technology services and the organization and function of the service system. The therapists would like training that is accessible and affordable in the areas of funding of technology and services; collaborating with families and other service providers; and accessing reliable, knowledgeable vendors. These findings underscore the need to develop pre-service and in-service training in assistive technology for providers who work with children who have disabilities.

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