



Telerehab

New Tools for Providing In-Home

Telemedicine, an umbrella term for a growing list of services, “utilizes information and telecommunications technology to transfer medical information for diagnosis, therapy, and education.”¹ In general, the communication occurs between a specialist and a provider or between a provider and a client. Within the provider–client domain, telemedicine traditionally has been considered a way to provide specialized services to remote areas where clients normally would not be able to receive services any other way. More recently, various forms of telemedicine are becoming an integral part of health care delivery regardless of distance or access to services.

This article discusses one particular type of telemedicine, *telerehabilitation*, and how it is being used to provide occupational therapy and speech therapy to clients with cognitive deficits following traumatic brain injury or stroke. At the Institute for Cognitive Prosthetics (ICP), primarily a research and development facility, therapists are conducting therapy sessions *exclusively* through telerehabilitation methods, whether the client is two blocks or two states away. On the basis of our experience with clients who had achieved maximal benefit from tradition-

al home or outpatient therapy, telerehabilitation techniques enabled them to improve self-sufficiency, productivity, and cognitive functioning.

ICP has been providing telerehabilitation services since 1991. In our experience, the clients who are most able to benefit from this type of program are those with memory, cognitive, and communication deficits resulting from an acquired brain injury or stroke. Because it is a compensatory approach, clients with some level of insight and acceptance of limitations tend to have more successful outcomes. The efficacy of telerehabilitation has been shown in clients 6 months postinjury or later, although opportunities to intervene earlier also have been explored with good results. ICP has primarily focused on adults, and to a lesser extent teenagers, with stroke and brain injury.

HOW ARE TELEREHABILITATION SESSIONS CONDUCTED?

In this model, the therapist conducts all sessions from a centralized office, using a computer specialized for telerehabilitation. Each client is provided with a computer in the home, which the therapist helps to set up to ensure a proper “fit” with the environment and to make accessibility adaptations if needed. The therapist has extensive training and experience in computer hardware, software, and communications and is sup-

TIPS

- Contact your state licensure board for telerehabilitation practice requirements in both your state and the client’s state (if different).
- Focus on computer-based solutions, not on how to use the computer.
- Be flexible and willing to reschedule sessions to accommodate the client’s functional level and daily rhythms.

ported by technical staff dedicated to assisting with setup and troubleshooting.

The therapist initiates each session by contacting the client and then establishing an online “virtual” connection. The online session simulates the therapist sitting in the client’s home while working on an activity. Through videoconferencing, the client and therapist see and hear each other through their computers. Conversations and nonverbal interactions take place in real-time, and the picture and audio quality are equivalent to those of a video camera. The therapist and client both are able to type and control the mouse on the client’s computer, where the majority of the materials for the activity are

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Brain Injury Rehabilitation

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housed. In this way, the therapist can observe the client's actions, model new skills, and intervene as needed.

The role of the computer in telerehabilitation is distinctive. It serves as a conduit through which the client and therapist develop compensatory systems that are applied to the client's real-life functional activities and problems. Software, such as a word processor, calendar, or spreadsheet, is developed to help a client compensate for cognitive deficits affecting functional activities (e.g., memory, self-monitoring, organization, time management). The therapist uses proprietary cognitive prosthetic software designed specifically for rehabilitation to customize the client's programs to meet specific functional needs and performance level.²

Because each system is personalized, clients spend very little time learning how to use the software. Rather, therapy focuses on learning how to apply the computer-based solutions to the activities that the client wants to accomplish.³ The following are examples of how therapy and technology are used to focus on real-life functional activities in telerehabilitation:

- Facilitating letter writing or e-mail for persons with cognitive problems or physical deficits, possibly through speech recognition software
- Enabling verbal communication and information and language processing

for persons with speech impairments by having the computer "speak" for them

- Scheduling each day to provide structure and initiation cues for persons who have difficulty remembering things they need to do, beginning activities, or organizing their actions
- Prompting for memory and initiating activities by sending messages to a cell phone or pager.
- Providing organizational systems to assist a person with activities such as sequencing the steps to make a pot of coffee, finding a phone number, or writing a shopping list
- Helping persons with short-term memory deficits remember important information (e.g., a calendar or a multimedia program, including photographs, videos, audio, and textual components to aid memory of people and events)
- Creating a money management system that allows persons with limited organizational or memory abilities to independently pay bills and budget their finances

ADVANTAGES OF TELEREHABILITATION

An occupational therapist practicing from a client-centered approach is concerned

with the interaction of the person, the task, and the environment.⁴ Therefore, therapy would ideally take place within the client's environment during the natural occurrence of the target activity. Telerehabilitation enables the therapist to approach this ideal by treating the client in his or her home with greater efficiency and flexibility than in an on-site treatment model.

A client's performance while practicing functional activities in a simulated environment is not predictive of performance at home. Persons with cognitive deficits have a significantly compromised ability to transfer skills learned in one setting to another setting. In an outpatient rehabilitation model, the therapist cannot directly identify and modify environmental influences on the task. In ICP's telerehabilitation model, the therapist focuses directly on the client's daily activities, using the computer as a medium and a means of modifying the environment or the task.

Despite the lack of in-person contact, the telerehabilitation therapist and client can achieve a level of accessibility that is unattainable through traditional



methods of service delivery. Because neither party expends time and energy on travel, scheduling becomes more flexible, leading to clinical benefits for the client and administrative benefits for the therapist. Therapy can occur for shorter, more frequent periods to accommodate the client's functional level and daily rhythms. If the client experiences fatigue or temporary malaise or something "comes up" in the client's life (e.g., an unexpected visit from a friend), the session can usually be postponed rather than cancelled. This flexibility is possible because of the ease with which the therapist and client can initiate and engage in a session, although the therapist needs to balance his or her schedule carefully.

ENHANCED CLIENT-THERAPIST COMMUNICATION

In ICP's telerehabilitation model, communication between the client and therapist occurs through synchronous (live, real-time sessions) and asynchronous (e-mail, journal-writing, performance data) interactions. As a result, the therapist has a plethora of accurate, timely details about the client on which to base clinical decisions. The client is encouraged to contact the telerehabilitation therapist when problems occur so that the therapist can introduce and reinforce compensatory mechanisms more directly. This contact is accomplished in several ways. The client may simply telephone the therapist as a problem arises, which the therapist may be able to help resolve in a matter of minutes. The client may document the problem by typing it into the computer journal, which is automatically delivered to the therapist within a day. Clients also can e-mail the therapist. They have made interesting use of this option, sometimes sending a one-line message about an issue of which they want the therapist to be aware. The therapist then is responsible for addressing this issue, whether at the next scheduled session or more immediately, depending on the need. This communication system releases the client from having to remember all the issues that arise throughout the day and week and bring them up during a session.

ICP also monitors the client through performance data collection. The client's

computer stores detailed data about the hardware and software use and delivers a daily log to the therapist. The data enable the therapist to be aware of the client's activities between sessions and can alert the therapist to problems that the client may not be aware of or has forgotten. For example, a client gave a therapist a letter that had been written on the computer the previous evening. The client reported that writing the letter went very well. However, the data showed that the client spent 3 hours over 2 days writing the three paragraphs, made multiple corrections and reprinted the letter each time, and had difficulty finding the file the next morning to continue working on it. With this information, the therapist was able to revise the client's word processor to improve performance in writing.

THE THERAPEUTIC RELATIONSHIP

Several aspects of the therapeutic relationship appear to be enhanced through telerehabilitation. Clients may be more likely to drop their guard and reveal their "true selves," giving the therapist insight into their lives that otherwise might not be revealed. One study showed that patients interviewed by a nurse in person were less likely to reveal personal information, such as HIV exposure and alcohol use, than when they were interviewed through videoconferencing.⁵ Craig Childress, a psychologist who has studied the use of e-mail in conjunction with in-person psychotherapy, stated,

The perceived availability of the therapist may also enhance the client's ability to incorporate the therapist's presence into daily life. Rather than waiting for the weekly in-person session to discuss an issue, the client can instead write the therapist an e-mail while the issue is still active, thereby evoking the therapist's psychological presence in the moment.⁶

In ICP's program, several clients have reported that they feel a distinctly deeper relationship with their telerehabilitation therapist than with in-person therapists. One client stated,

I can tell [the telerehabilitation therapist] everything that's going on. With the other therapists, I could only tell them what thoughts

I was able to pull together for them in the time I had in my session. And when I was finished telling them what I thought was the most important, there was little time left to figure out what to do about it.

Additionally, clients do not feel socially obligated to expend extra energy on grooming and housecleaning to prepare for a visit with the telerehabilitation therapist. The clients and their environments are exposed to the therapist in a true-to-life form, rather than "dressed up."

CASE EXAMPLE

Mary was referred to ICP by a neuropsychologist. At age 42 she had suddenly suffered a ruptured aneurysm, requiring an emergency craniotomy and surgical clipping. She recovered physically from the event, but several months later she complained of persistent difficulties with managing day-to-day activities. She could not remember to take her medications and had difficulty initiating and sequencing multiple-step tasks, such as making a pot of coffee. She also experienced cognitive fatigue to the extent that when she had a major outing (such as a physician's appointment or shopping), she was too tired after returning home to change her clothes or prepare a meal for herself. Her house had become unmanageable, with piles of dirty laundry and dishes, unsorted mail, and half-started activities. She often went a full day without remembering to eat or drink (she had lost her sense of thirst and hunger). She neglected many self-care tasks, often going a week without bathing. Despite this picture, Mary was a woman of superior intelligence and artistic capability. She had such fluent verbal skills that during a conversation it was difficult to believe that she had a severe cognitive impairment.

Neuropsychological testing revealed that Mary demonstrated moderate deficits in complex verbal memory, auditory verbal recall, concentration, abstract reasoning, and information processing speed. She initially participated in an outpatient cognitive rehabilitation program for 3 days a week. After 2 weeks, Mary and her neuropsychologist recognized that she was not benefiting from the program. Some of the

problems included the following:

- Mary's fatigue level prevented her from consistently attending. The effort she needed to expend to prepare herself and travel to the facility, followed by 2 hours of intensive cognitive work, rendered her "out of commission" for the remainder of the day, further straining her ability to perform necessary daily activities at home.
- She had difficulty explaining to the therapists how her cognitive deficits affected her ability to perform day-to-day activities at home. The therapists suggested some strategies for addressing the problems, but Mary was not able to implement them.

ICP provided Mary with a computer, which the occupational therapist set up in Mary's home. The telerehabilitation program was initiated with short sessions once or twice a day as tolerated by Mary. Although she had never used a computer, Mary immediately recognized its potential and began using it several times a day, including a period late at night when she was most able to engage in cognitively demanding activities. She significantly improved her ability to perform such activities as reading, writing, organizing and planning activities, and managing her finances and other paperwork. The occupational therapist evaluated Mary's activities and performance during that time by collecting data from the computer. The therapist supported each activity by working with Mary to develop, implement, and refine computer-based compensatory strategies.

Mary found that she was able to concentrate on computer-based tasks for longer periods and with less cognitive fatigue than other tasks. The inherent structure of her software allowed her to perform more complicated and complex activities, such as reconciling insurance claims and reading medical research journals. In addition, the Save function allowed her to put away an unfinished task easily when she became tired or needed to attend to something else. The occupational therapist helped guide Mary toward an online education program in Web design, pursuing a pre-morbid career interest in graphics.

At the end of treatment, Mary was reevaluated by her original neuropsychologist.



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chologist. The evaluation indicated a "marked improvement" in all areas of functioning, attributed to her participation in the telerehabilitation program.

TELEREHABILITATION PRACTICE CONSIDERATIONS

Several issues surrounding telerehabilitation still need to be resolved, many of which are being pursued by the American Telemedicine Association as well as by the American Occupational Therapy Association (AOTA), which monitors developments such as reimbursement and interstate licensing. Reimbursement of telerehabilitation services is one of these issues. Currently, Medicare does not reimburse for telerehabilitation services, although HCFA program memos that recommend reimbursement for office visits, consultations, psychotherapy, pharmacological management, and home care suggest that headway is being made.^{7,8} Over the past 5 years, ICP acquired payment from private insurance, workers' compensation, and private pay.

Other administrative issues include interstate licensing (when the client and therapist are in different states) and confidentiality. AOTA recommends contacting state licensure boards regarding requirements about practice in your state and any state in which services are delivered (where the client lives). Issues of both confidentiality and privacy are technical concerns in terms of communications security and procedures, as well as ethical concerns. Therapists need to be aware of the psychosocial issues involving intensive rehabilitation in the home and the remote therapeutic relationship. *The Occupational Therapy Code of Ethics (2000)*⁹ and other applicable AOTA official documents should be followed, just as they are in other practice settings.

The reliability, performance, availability, and cost of the technology that supports telerehabilitation is another area of concern. The technology is con-

stantly changing, and each new evolution resolves some technical issues while creating others. It is important that therapists have technical staff members trained and experienced in telemedicine and electronic communications to support them in the technological aspects of delivering services. As the technology improves, becomes less expensive, and becomes more available, the quality of care through telerehabilitation also should improve.

Despite the cost of the technology and the difficulty obtaining reimbursement from third-party payers for computer equipment and technical support, it is important to recognize the potential cost savings of this model. Travel costs are eliminated, and the overhead costs of office and clinic space are greatly reduced. These savings help to offset the cost of the technology and technical support.

CONCLUSION

The telerehabilitation model at ICP has enabled us to bridge many of the difficulties of an outpatient facility, particularly when working with persons with cognitive deficits, because it addresses the challenge of transferring skills from the clinic to the home. Although the required technical expertise and lack of hands-on in-person contact can be daunting and difficult to conceptualize, the clinical benefits of a telerehabilitation model to our clients have been impressive. Although many issues need to be addressed before telerehabilitation is a widely available delivery mechanism, occupational therapists should keep an eye on this developing field. ■

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FOR MORE INFORMATION

Cognition and Occupation in Rehabilitation: Cognitive Models for Intervention in Occupational Therapy
 Edited by N. Katz, 1998. Bethesda, MD: American Occupational Therapy Association. (\$35 for members; \$45 for nonmembers. To order, call toll free 877-404-AOTA.)

Occupational Therapy Assessment Tools—An Annotated Index
 By I. E. Asher, 1996. Bethesda, MD: American Occupational Therapy Association. (\$32 for members; \$40 for nonmembers. To order, call toll free 877-404-AOTA.)

Occupational Therapy Practice Guidelines for Adults With Traumatic Brain Injury
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Occupational Therapy Treatment Goals for the Physically and Cognitively Disabled
 By C. K. Allen, C. A. Earhart, & T. Blue, 1992. Rockville, MD: American Occupational Therapy Association. (\$45 for members; \$58 for nonmembers. To order, call toll free 877-404-AOTA.)

Physical Disabilities Practice Guidelines Series Set
 By the American Occupational Therapy Association. Bethesda, MD: Author. (9-title set. \$135 for members;

\$207 for nonmembers. To order, call toll free 877-404-AOTA.)



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Elliot Cole, PhD, is one of the few computer scientists worldwide working in the field of cognitive rehabilitation. He is the founder of the Institute for Cognitive Prosthetics and a peer reviewer for the National Science Foundation and the National Institutes of Health.

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