

# Rehabilitation



## The right prescription for managing complex medical patients

BY MICHAEL  
STUBBLEFIELD, M.D.

**P**hysiatrists and other medical rehabilitation professionals are interested in treating patients as a whole rather than just their medical conditions. While maintaining this outlook is vital for optimizing outcomes, it is equally important to identify opportunities for improvement in providing multidisciplinary, individualized care. As people with rehabilitation needs live longer, managing their complex challenges,

including end-of-life concerns, calls for the use of both restorative and supportive approaches to treatment.

### UNTANGLING PATIENT NEEDS

A basic tenet of rehabilitation is to provide restorative care—that is, to discharge people to their homes at the highest level of functioning and quality of life possible. Neurological and musculoskeletal injuries and illnesses often result in complex symptoms that must be monitored and treated on an inpatient and outpatient basis. But patients' needs nearly always extend into nonphysical areas of functioning.

Psychosocial difficulties arise as people experience dramatic reductions in autonomy and daily living. Anxiety or depression can occur when patients worry whether they will regain previous levels of independence. In violent injuries, including those related to military combat exposure, post-traumatic stress disorder often results. And although many medical diagnoses are treatable, functioning may be forever diminished, impinging on quality of life.

Financial constraints are another stark reality that impacts day-to-day life and mental health. A person living alone in an upstairs residence who sustains a paralyzing injury now faces tough decisions regarding whether to relocate, how to find a new home and what to do in the meantime. Unfortunately, insurance is not a fail-safe option. Many patients incur tens of thousands of dollars in out-of-pocket medical expenses and may not be able to absorb these costs.

Vocational difficulties further exacerbate economic burdens. Not only does one's occupation represent a tangible source of income, but it also provides intangible effects of healthy self-esteem and pride from being able to support oneself.

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When that opportunity disappears, it can be a tremendous strain, especially for younger patients in their prime earning years.

## COMFORT, NOT CURES

For terminally ill patients with complex needs, the rehabilitation plan must provide supportive, not restorative, care. Rather than focusing on prolonging life and re-establishing their original level of independence, the emphasis should be on minimizing symptoms, increasing comfort and avoiding invasive interventions with noxious side effects. Kessler Institute for Rehabilitation's supportive model for cancer and nononcology populations is, compared with restorative care, shorter and more focused on relieving pain and discharging to home as soon as possible, often with palliative care as opposed to visiting-nurse services. For the appropriate patient, home hospice services often have more benefits, including coverage of medication costs and the availability of clergy and psychosocial counseling.

Assessment of family support in such cases is vital, as a lack of caregiver assistance can delay positive outcomes. But too much involvement can be equally problematic when well-meaning loved ones impede the rehabilitation process with unrealistic expectations about goals and recovery. A disconnect between what is functionally possible and what the patient or relatives expect can cause tension during either supportive or restorative treatment.

## OPPORTUNITIES FOR IMPROVEMENT

Although physical medicine clinicians are accustomed to taking a holistic view of patients, improvements can still be made to ensure all treatment needs are met. Our ability to identify and manage symptoms and problems is often limited by poor communication with the referring acute care hospital and outside primary care physicians and specialists. Health care facilities with linked electronic medical records have an advantage because information can be easily shared across sites and providers. But many rehabilitation hospitals do not have such integration.

At Kessler and several other rehabilitation facilities, we rely on the acute care hospital to send the necessary information to determine appropriateness of admission. This usually comes from a hospitalist, who may not know the patient's entire history. To remedy this, Kessler's Cancer Rehabilitation program developed a standardized method to improve intake. Rather than combing through charts and reporting only what's easily available, a liaison uses an enhanced preadmission screening tool. When key details are absent, he or she will reach out to appropriate members of the patient's medical team to obtain

the needed data. This often proves invaluable in determining if rehabilitation is justified (see "Examining the Evidence"). This small change can have big consequences; even seemingly minor items can help inform, for instance, whether a person can return to work or needs hospice care—vastly different discharge goals.

Meeting complex patient needs also requires somewhat of a culture shift. Locating missing medical information and making phone calls takes time and can be tedious, but such actions are necessary. Additionally, specialized team rounds are a pivotal educational opportunity that can be better leveraged to discuss complicated cases and brainstorm how the rehabilitation team can best help care for an individual.

An adage says it takes a village to raise a child, but the same applies to providing rehabilitation care. Physicians, nurses, therapists, social workers, psychologists and case managers must work in concert with one another as well as with patients, families and outside providers to achieve treatment goals and optimize both restorative and supportive care approaches.



Read the seminal study by Temel and colleagues (2010) documenting quality-of-life and survival benefits of supportive care at [nejm.org/doi/full/10.1056/NEJMoa1000678#t=article](http://nejm.org/doi/full/10.1056/NEJMoa1000678#t=article).



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## EXAMINING THE EVIDENCE

A simple but important retrospective study is underway to help evaluate the effectiveness of the standardized intake method developed by Kessler's Cancer Rehabilitation team. Staff will review charts to assess the degree to which nurse liaisons successfully documented information needed to determine whether inpatient rehabilitation was justified. This includes the patient's full oncological and medical history, metastatic status and treatment response. The goal is to compare the level of knowledge before and after implementation of the program, with the hope of demonstrating quantifiable improvements in outcomes such as length of hospital stay and number of readmissions. If successful, this systematic approach could be generalized to other areas of medicine.

FOCUS ON

## Rehabilitation

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# Pushing through on regulatory reform in a time of flux



As this issue went to press, the full Congress had yet to pass any health care reform bill to replace the Affordable Care Act (ACA). The failed effort to approve a replacement for the ACA, however, does not mean that additional regulatory and further legislative efforts are off the table. Indeed, we appear to have entered a world of openness to true reform, which could lead to positive improvements in the inpatient rehabilitation hospital field.

Which is why, rather than focusing just on legislation, it is important to continue to address regulatory changes that protect and improve our industry.

We are drowning in a sea of regulatory requirements that constrain which patients we can admit and care for, how long we can treat them and what we can achieve—not to mention if and when we are paid and can retain those payments.

Ideally, regulatory changes could:

- Return to the presumption that the rehabilitation physician is medically correct when accepting a patient for inpatient rehabilitation hospital care. This requires preventing nontreating reviewers from concurrently or retrospectively overriding physician decisions regarding the most appropriate setting and medical management for these individuals.
- Reduce the burdensome administrative requirements that make it harder every day to practice medicine, such as the increasingly onerous reporting and documentation.
- Codify principles that put a patient's best interests at heart. For instance, the push for site-neutral payment models currently under discussion could be disastrous because we know that most people treated in inpatient rehabilitation hospitals have better long-term clinical outcomes than those treated in skilled nursing facilities.
- Ensure transparency regarding patient rights and responsibilities as well as health care costs.
- Clarify conditions of participation. These define the differences among inpatient rehabilitation hospitals, acute care hospitals, long-term acute care hospitals and skilled nursing homes. However, many of these conditional elements are far from ideal in distinguishing among sites.
- Modify audit systems to make them more reasonable and less burdensome to providers, and to ensure they reward appropriate conduct as well as punish blatant and deliberate abuses of the payment system. This also requires an appeals method that is timely, responsive, easy to navigate, balanced in its implementation and able to provide proportionate consequences based on provider conduct.
- Require long-term accountability for placement decisions. As research demonstrates, the initial site of care has a significant impact on morbidity and mortality over time. This should be considered in coverage decisions.

A time of change is a time of opportunity. Thus, the inpatient rehabilitation field should seek to advance our patients' interests now.

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# CAD/CAM technologies: Taking rehabilitation to another dimension

BY BRUCE POMERANZ, M.D., AND ERIC SCHWELKE, CPO, LPO

**P**rothetic and orthotic devices for upper and lower extremity deficits have a powerful effect on patients' functioning, independence and quality of life. As such, clinicians seek to design and fabricate interfaces that maximize alignment and functioning without compromising comfort or impeding rehabilitation. Increasingly, computer technology is being realized to help automate the manufacturing process, giving prosthetists and orthotists important new tools to achieve treatment goals with increasing speed, precision and reliability.

## AN INNOVATIVE APPROACH

The linchpin to ensuring patients receive well-fitting prostheses and orthoses is perfecting the design and fabrication of the interface, or socket. Historically, this has been accomplished by hand, using negative impressions taken of the affected limb in a process called casting. That structure is then filled with liquid plaster of Paris to produce a positive mold that can be shaped manually into a physical model. Casting requires extensive clinical experience and knowledge of biomechanics and anatomy to ensure this process accurately captures the shape and contouring needed to fabricate an interface that fits the individual appropriately. Once the positive model is developed and the socket is shaped, it is tested on the patient for fit and comfort and refabricated as needed.

This approach has served the rehabilitation field well for decades, but as in just about every other corner of the health care industry, computerized technology is being leveraged to improve traditional methods. Over the past three decades,

computer-aided design (CAD) and computer-aided manufacturing (CAM) have become increasingly important to the prosthetic and orthotic profession by providing tools to assure optimal-fitting interfaces with greater speed and efficiency. CAD/CAM technologies work together to allow a prosthetist or orthotist to manipulate digital representations of objects in three dimensions (3-D). Rather than obtaining measurements of a person's body manually, a digital image of the affected limb is captured using a handheld scanner. Additionally, some computer programs can integrate ultrasound, magnetic resonance imaging or computed tomography to obtain an even more detailed depiction of the anatomical landscape. Using engineering software, the resulting image is transferred into a digital file that can be resized and reshaped until the model has the desired biomechanical properties, based on the patient's anatomy. The file is then sent to a specialized milling machine, or carver, which creates a positive model from a variety of materials—most often polyurethane. The carver reduces a block of polyurethane foam into the positive model based on the digital file produced by design specifications, a process called subtractive manufacturing.

While a carver produces a physical model by removing existing material, a 3-D printer works in the opposite manner. In what is known as additive manufacturing, 3-D printers build the socket, layer by layer, by depositing sheets of powdered metal or plastic according to specifications input through CAD/CAM software. Over the past decade, 3-D printing has begun proliferating in



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medical disciplines such as dentistry and surgery, but the orthotics and prosthetics community is only beginning to fully appreciate its potential for amputee populations.

## ASSESSING TRADE-OFFS

A test socket can be designed and fabricated by computer much faster than when performed manually. Traditional casting not only involves applying plaster bandages by hand, but the prosthetist or orthotist also must wait for the mold to set before finishing the interface. When modifications are needed, a clinician using CAD/CAM can alter the rendered model on a computer screen within minutes, if not seconds, and then resend the digital file for production. If a carver is on the premises, this can be done while the patient waits. Using the plaster method, a follow-up appointment would have to be scheduled, resulting in delayed care. CAD/CAM can also achieve greater socket compliance with the individual's anatomy. This is key to reducing the likelihood of interface sores, pressure and discomfort—all of which make the patient less likely to use the assistive device.

The conventional method of casting is much more labor-intensive and subsequently incurs greater expenses. However, CAD/CAM—as well as the carving machine or 3-D printer used with them—can be cost-prohibitive, running into the hundreds of thousands of dollars. Each CAD/CAM system uses unique software, which alone can cost well over \$10,000. In addition, there is a distinct learning curve to understanding and applying computerized technology, which requires user time, training and patience.

There are also justifiable concerns about the strength and sturdiness of components created by 3-D printing, as the materials most commonly used for prostheses and orthoses—acrylonitrile butadiene styrene and polylactic acid—tend to be lighter in weight. However, this could be advantageous for pediatric amputees who need assistive devices that are not only light but can also be easily repaired or replaced if broken and as children grow. Carbon fiber also

could potentially be used as a reinforcement to increase the durability and meet the weight-bearing needs of adults.<sup>1</sup>

## FROM COMPUTERS TO CLINICS

Clinicians at Kessler Institute for Rehabilitation use both CAD/CAM and manual fabrication techniques, depending on practitioner and patient preferences. In general, the best approach is to align the method to the patients' individual rehabilitation needs and treatment goals. Some providers find conventional casting and fabrication more useful for geriatric amputees with older devices. Others may lack the training or desire to learn CAD/CAM and are simply more comfortable using hand tools.

Empirical evidence on CAD/CAM and 3-D printing for orthotics and prosthetics is still being cultivated, so little can be said in terms of their clinical and patient-reported outcomes (see "Patients' Perspectives"). A recent literature review<sup>1</sup> identified 58 3-D-printed upper limb prostheses but found little evidence from peer-reviewed sources to clarify the functionality and user experiences with these devices. Despite these gaps in scientific knowledge, some suggest that 3-D printing may offer a promising solution to worldwide shortages in patient access to prostheses and orthoses by increasing the speed and efficiency with which they can be produced.<sup>2</sup>

Although this technology unquestionably makes manufacturing and delivery more efficient, individuals benefit from CAD/CAM devices only when a trained prosthetist or orthotist is fully integrated into the rehabilitation team, from initial consultation through the design, fabrication, delivery and follow-up. If the field is to continue advancing this technology, we must ensure trainees not only acquire the necessary skills to responsibly operate the software and printing, but also possess the extensive clinical knowledge required to ensure optimal patient outcomes.

The utility of an assistive device hinges on the degree to which it meets a person's unique anatomical, medical and functional needs. In this way, CAD/CAM and 3-D platforms are allowing rehabilitation providers to harness the power of personalized medicine and provide the customized care that truly meets patients' expectations.

## PATIENTS' PERSPECTIVES

As individuals with limb loss continue to live longer, issues of assistive device durability, comfort and quality of life remain highly salient. A recent study from investigators in Turkey<sup>3</sup> sought to address these matters by assessing clinical and patient-reported outcomes among individuals with transtibial amputation (n=72).

Participants received either prosthetic sockets fashioned from CAD/CAM technology and carver printing or ones manufactured traditionally.



After three weeks of rehabilitation, the CAD/CAM recipients demonstrated significantly faster adaptation to their prostheses, greater duration of use and walking distance, and less self-reported pain during ambulation. The CAD/CAM group also exhibited significantly higher quality-of-life scores, including in the domains of physical health, emotional well-being, vitality, psychosocial adjustment, satisfaction with the prosthesis and activity limitation.



The National Institutes of Health 3-D Print Exchange is a public website for sharing and downloading 3-D print files. Learn more about its collection of prosthetics files at [3dprint.nih.gov/collections/prosthetics](http://3dprint.nih.gov/collections/prosthetics).

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# Adequacy of payment determination by MedPAC

## IMPLICATIONS FOR INPATIENT REHABILITATION HOSPITALS

BY BRUCE M. GANS, M.D.

The March report from the Medicare Payment Advisory Commission (MedPAC) contains a worrisome recommendation for inpatient rehabilitation hospitals. After years of calling for zero updates to payment rates, the commission now wants a 5 percent reduction in payment, as well as other changes that could adversely affect reimbursement and possibly the quality of care we provide to our patients.

The focus on post-acute care (PAC) comes through loud and clear in the report, which devotes a chapter to the topic, titled “The Congress and CMS must act to implement recommended changes to PAC payments.” The commission notes that it has worked for more than a decade on reform, with only incremental changes carried out.

“Changes need to be made in the post-acute care payment systems (i.e., the skilled nursing facility, home health agency, inpatient rehabilitation facility and long-term care hospital payment systems), and the cost of inaction is mounting,” wrote MedPAC chairman Francis J. Crosson, M.D.

“Ideally, the post-acute care sectors would be brought together under a unified payment system that would base payments on patient characteristics. Such a system could both lower costs and ensure access for patients who may be financially less desirable under current payment systems.”

Congress, of course, has ignored MedPAC recommendations for payment change to rehabilitation hospitals for years. The recommended 5 percent cut might be reflective of the commission’s frustration with Congress’ lack of movement on its repeated recommendations for a unified patient system.

The call for the cut is based in part on the perception of unacceptably high margins in the industry that MedPAC documents in its report. Aggregate margins for inpatient rehabilitation hospitals have risen steadily since 2009 to 13.9 percent in 2015, and they are projected to reach 14.3 percent this year. The panel also noted that while total payments may be more than sufficient, compensation for some facilities may be too high while for others it may be too low. MedPAC attributes this, in part, to differences in case mix and operating costs between freestanding and hospital-based units.

Thus, the commission also recommends expanding the high-cost outlier pool to redistribute payments within the inpatient rehabilitation hospital prospective payment system and reduce the impact of potential misalignments on costs.

The rehabilitation hospital field argues that this approach takes the industry in the wrong direction. There are alternatives beyond the “blunt instrument” of an across-the-board cut. These include:

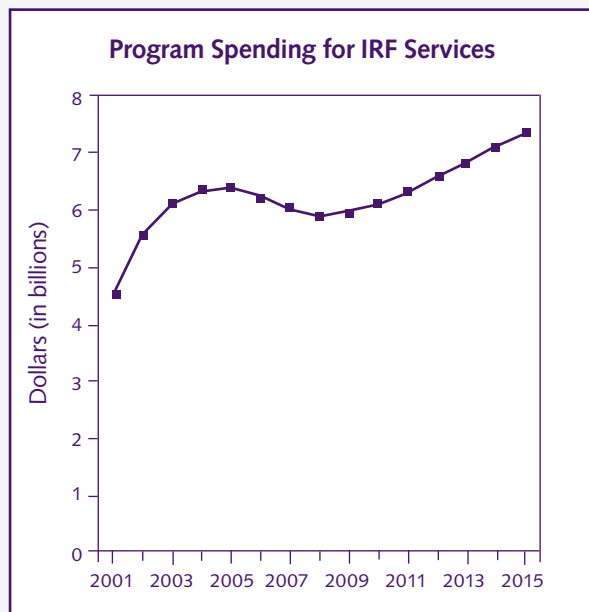
- Reinventing the post-acute care system to blend

institutional payment systems for all PAC providers into one integrated approach, which MedPAC has been studying and modeling for years.

- Rebasement of the inpatient rehabilitation hospital prospective payment system to more appropriately align with current costs.
- Increasing the outlier withhold. This, however, may punish efficient providers and reward inefficient ones. Conversely, it may disincentivize facilities to admit more complex and costly patients.

Our industry faces other pricing pressures in today’s volatile political atmosphere. These include the Medicare Post-Acute Care Value-Based Purchasing Act, still pending in the House. The act would evaluate providers’ performance primarily on Medicare spending per beneficiary (MSPB) over two years and would hold PAC providers accountable for “upstream” acute care expenditures made on the patient’s behalf before they even saw the patient. It considers just one quality outcome factor and then only after the first two years of the program. It also withholds 5 percent of Medicare reimbursement from PACs to create a pool to reward those who achieve the greatest reductions in the MSPB. Coupled with MedPAC’s proposed 5 percent cut, these payment reductions could be devastating for the industry.

In late April, the Centers for Medicare and Medicaid Services published its proposed rule for the rehabilitation hospital prospective payment system, the annual procedure by which Medicare makes such changes, which includes a small increase in the payment rates. Since MedPAC’s proposal requires congressional action, this is not surprising. Nevertheless, the field needs to remain vigilant as these issues are discussed if it is to protect and preserve patient access to the right care at the right place at the right time for the right price.



# HOW WEARING MANY HATS LEADS TO INCREASED COLLABORATION

AN INTERVIEW WITH STEVEN KIRSHBLUM, M.D.



When health care professionals join together to combine their unique skills and experiences, shared goals are achieved and patients reap the benefits. Thanks to his numerous appointments among various academic-medical facilities, Kessler Institute for Rehabilitation Senior Medical Officer Steven Kirshblum, M.D., has witnessed firsthand how synthesizing the talents of physical medicine and rehabilitation experts in a variety of roles fosters greater collaboration.

Kirshblum recently spoke with *Focus on Rehabilitation* to share his perspective on how clinicians, researchers and educators can work together to achieve a common vision for providing superior care.

**Focus on Rehabilitation:** What are your professional roles, and to what degree do they overlap?

**Steven Kirshblum, M.D.:** I am honored to serve as chair of physical medicine and rehabilitation at Rutgers New Jersey Medical School, as well as having leadership roles within Kessler Institute for Rehabilitation and Kessler Foundation, and as chief academic officer for Select Medical Rehabilitation Division. While this may sound complex, these roles coalesce around common areas of importance: conducting state-of-the-art clinical research that will directly impact clinical care to patients with physical or cognitive impairments, and finding ways to educate students and physicians in offering compassionate care for people with significant trauma- or illness-related challenges.

The overlap allows for partnerships across the local affiliated programs (i.e., Kessler Institute, Kessler Foundation and Rutgers) as well as with joint projects with other Select Medical partners across the

country. One example is an extension of a study on neglect in stroke populations led by Drs. Anna Barrett and Peii Chen being performed locally at Kessler Institute and Kessler Foundation in New Jersey and now including a number of Select Medical rehabilitation hospitals across the country. Similarly, our Kessler researchers also partnered with colleagues in other departments at Rutgers on a recently submitted grant proposal to the National Institutes of Health.

Further, the recently established Select Medical Academic Consortium is looking for ways to further enhance the exchange of knowledge and resources within its network, whether through continuing medical education activities, lectures for residents or clinical exposure opportunities for trainees that otherwise wouldn't necessarily be available at their home institution. So there is a lot of movement among these different organizations, which helps lead to even greater collaboration in the future and informs research and training efforts across the board.

**Focus:** Have you encountered any challenges in trying to bring together people from different departments or organizations—particularly those with different perspectives, skill sets or clinical experiences?

**Kirshblum:** I have found that mostly everyone is excited and interested in teaming up once they realize the mutual benefits. The key is that ego has to be secondary. Once people let go of that, they realize that trying to accomplish things in a silo is less effective at reaching the goals. Partnering with rehabilitation facilities throughout the country, for example, gives everyone the ability to provide more input into the design of a project, recruit more diverse study populations and complete

research in a rapid time frame. And the truth is, it's also a lot more fun; you learn from others and make new colleagues.

**Focus:** What advice can you offer colleagues who want to collaborate but are having trouble identifying opportunities for doing so? For instance, clinicians might be interested in integrating residents or fellows at their site, but they do not work at an institution affiliated with a medical-academic center.

**Kirshblum:** There are always people we don't think about who have similar interests or ideals as us, but they might go unnoticed. You have to consider who is around you who might be able to collaborate. Contacting local academic institutions is helpful in this regard. Health care is changing, and medical systems are becoming larger rather than smaller, so one should investigate whether any other organizations your facility partners with might have someone willing to join you in research projects or can support training activities.

**Focus:** Any final thoughts on how to be successful when juggling so many different roles?

**Kirshblum:** I think the key aspect to being involved in so many roles is to maintain focus on the overall shared vision that will help unite us and our efforts. If I am successful, it's only because others are successful, and if that happens, we will bring greater advances to people in the field of physical medicine and rehabilitation.



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## Mental health services from a distance

BY MONIQUE TREMAINE, PH.D.

The mental health needs of people with musculoskeletal and neurological deficits vary widely in scope, chronicity and patient impact. From simple reactive depression to progressive dementia to lifelong post-traumatic stress disorder, mental health professionals in rehabilitation settings assess, treat and monitor individuals with diverse conditions that impede recovery goals.

The evidence base for telepsychology in meeting mental health needs has been well established, but as this innovative platform evolves, we're witnessing gaps in its utility. For clinicians, this requires an ongoing search for opportunities to leverage these tools to increase access and enhance patient outcomes.

### CONTINUED REFINEMENTS

Very few patients can obtain comprehensive rehabilitation treatments and psychological and neuropsychological services, primarily because of limitations in access to care and insurance obstacles. While telemental health can help overcome geographic barriers, clinicians still face an uphill battle. For example, telepsychology poses unique challenges in HIPAA compliance and patient privacy, often rendering insufficient popular platforms such as email and Skype. Only a handful of states have adopted a Medicare mandate for equal reimbursement of telehealth practices as for in-person care, but fortunately approval for most other states is in varying stages of legislation.

There are also disparities in the types of services best facilitated by these innovations that can benefit from continued improvement. Telehealth approaches for individual

psychotherapy have been validated through research from the Department of Veterans Affairs, which has demonstrated equivalent effectiveness with face-to-face counseling. But its widespread application in civilian populations has lagged because of the absence of state-to-state licensure guidelines and reimbursement mandates.

Unlike individual psychotherapy, little evidence supports remote approaches to neuropsychological testing, despite a high demand for such services. Traditional cognitive assessment tools undergo extensive standardization and validation procedures prior to widespread use. Providing a remote assessment inherently changes the standard administration of that measure, which affects the validity and reliability of its results. Further research is underway to better establish the efficacy of these and other telemental health interventions, including group psychotherapy and cognitive rehabilitation. If supported, these could expand the number of people accessing psychological care and allow individuals from one rehabilitation setting to be treated by a more resourced hospital—likely a boon to rural, smaller and underfunded facilities.

### INITIAL INDICATORS

The use of telemedicine in neuropsychology is in its infancy, but early experiences at Kessler Institute for Rehabilitation in providing these much-needed services may portend a positive future. Current applications include remote diagnostic interviewing; giving patient and family feedback of testing results; and providing neuropsychological and behavioral interventions and guidance

on behalf of the patient, family or treatment team. Given the lack of reliable data for neurocognitive batteries provided remotely, Kessler clinicians are focusing more on administration of brief screening tools, which are easier to provide from a distance than comprehensive neurological assessments involving the use of manipulatives such as puzzles. Further, pilot research projects are allowing Kessler to experiment with expanding its services by offering neuropsychology care to more distant clinics. This has been accomplished by having a postdoctoral trainee administer an assessment or intervention while a supervising clinician based elsewhere monitors and provides feedback to the student.

Telemedicine has tremendous potential in the physical medicine setting. As this field evolves, we are likely to see increased development of organizational practice standards and guidelines as well as new protocols for psychotherapy and assessment, including the use of artificial intelligence and robotic platforms. Coupled with adequate state mandates for reimbursement, these advances represent a new world of effective, validated delivery models for specialized neuropsychological and psychiatric services.



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