Despite its futuristic-sounding name, laser therapy as a medical intervention has been in use or under investigation for more than 40 years. But whether these treatments are fruitful or futile remains a topic of discussion—a conversation that starts by scrutinizing the state of the science.

Low-level laser therapy—or cold laser therapy—is categorized into three classes based on wattage and hazard potential, ranging from less than 1 milliwatt (Classes I and II) to 500 milliwatts (Class III). These lasers generate light in a single wavelength, with output strong enough to penetrate only a few millimeters into the tissue and musculoskeletal structures, akin to the effect of holding a flashlight to your hand.

Newer lasers are available that operate at a much higher power, termed Class IV devices. Because these are powered up to 10 watts and can penetrate approximately 4 inches (10 centimeters) deep, they are applied in a pulsing manner rather than continuously to reduce the likelihood of damage to skin and blood vessels. For use in physical medicine and rehabilitation, these high-powered lasers have been deployed and studied only in the past five years.

Mixed Signals

Systematic literature reviews performed by Cigna and Aetna health care insurance companies as well as The Cochrane Collaboration, the nonprofit research organization recognized as a leader in conducting meta-analyses of available literature, have attempted to clarify our understanding of whether laser therapy is efficacious for musculoskeletal disorders. Results from their reviews of clinical data are inconsistent, with outcomes depending primarily on study design and application. Lower-powered laser therapy has greater representation simply because higher-powered lasers are newer.

The greatest support appears to exist for laser therapy as an analgesic and anti-inflammatory intervention for osteoarthritis, rheumatoid arthritis, and myofascial pain in the more superficially accessible joints, such as in temporomandibular joint dysfunction. For these conditions, laser therapy confers some benefit for improving subjective ratings of pain and enhancing physical functioning to a limited degree.

There continues to be either a shortage of clear evidence or... (continued on page 7)
The time is now to stem the tide of preventable injuries

THE “SIGNATURE” CONDITION for a rehabilitation hospital is trauma affecting the spinal cord, the brain or—as the Boston Marathon bombing demonstrated—loss of limbs. The irreversibility and severity of such injuries leave many clinicians feeling helpless. Fortunately, we in rehabilitation are not. Because we care for so many of these patients, we have an important role to play in preventing these injuries, whether at the patient, community or national level.

There are numerous types of preventable injuries. The most common, of course, are related to automobile crashes, diving accidents, falls, contact sports, interpersonal violence and firearms. All can be addressed through appropriate interventions.

For instance, I now routinely ask my patients if they have any firearms in the home. Recently, an individual told me he was planning to purchase a gun, which prompted a conversation about safely storing the weapon, including the use of a trigger lock and a safe.

When I was a resident at the University of Washington in Seattle, we saw numerous cervical spine injuries caused by kids playing on trampolines. The faculty mounted a campaign to ban trampolines from public schools, resulting in a significant drop in these incidents. This was when I realized that those of us practicing in the hospital setting could reach out and stimulate change.

Other areas in which rehabilitation can take an active role include automotive safety campaigns, fall prevention efforts, involvement in the Centers for Disease Control and Prevention (CDC) National Center for Injury Prevention and Control, and local community education.

The research our field has done through Model Systems programs can also help identify key injury causes and develop intervention strategies.

Rehabilitation hospitals can and should take action to educate patients and the community, and to implement programs that can reduce injuries, including:

1. Defining the leading causes of preventable traumas in your community. You can search the CDC’s WISQARSTM (Web-based Injury Statistics Query and Reporting System) to receive customized reports of data in your region.

2. Identifying organizations/coalitions dedicated to injury prevention. A good place to start is with local or state public health offices and hospital emergency departments.

3. Choosing an individual or team within your institution to lead the efforts.

4. Implementing an injury-prevention program based on best practices. Examples of these approaches may be found on the CDC site cdc.gov/injury.

As you review potential approaches, remember that the most effective actions appear to be those that change the environment, such as reducing and enforcing speed limits, packaging cigarettes with stronger warnings and installing soft surfaces on playgrounds.

Those of us in the rehabilitation community intuitively understand the interface among health, function and our surroundings. Thus, it makes sense that we should work to change the environment to reduce disabling, preventable injuries.
When inpatient rehabilitation and trauma care collaborate, patients benefit

BY ALLISON M. AVERILL, M.D.

Fast and Efficient intervention by multiple disciplines during critical care is the linchpin for ensuring individuals who have sustained traumatic injuries to the musculoskeletal and nervous systems achieve maximum recovery. Despite being a key player in this effort, physical medicine and rehabilitation is often not involved until long after patients are stable and ready for discharge. But at Kessler Institute for Rehabilitation, this trend is reversing by expanding the role of physiatrists to that of active collaborators with the trauma and intensive care teams at Hackensack University Medical Center (HUMC).

Time Is of the Essence

Trauma centers and intensive care units are replete with patients whose medical conditions can benefit from physiatric services, including acquired injuries from external force, as in motor vehicle accidents, falls or other blunt force trauma; closed- and open-head wounds; and spinal cord and other musculoskeletal injuries. The need to keep people alive and stable is clearly the priority, but physiatrists provide focus on aspects of treatment that are likely to impact patients’ longer term functioning and that might be overlooked easily during critical care.

In general, the faster the restoration of motor, cognitive and behavioral functioning the greater the likelihood for a person to optimize activities of daily living, vocational or educational performance, and quality of life. Kessler physiatrists help hasten this by ensuring rehabilitation begins quickly and that the trajectory of care is planned appropriately. This is largely achieved through participation in weekly rounds with the HUMC trauma team and providing urgent consultations as needed.

For example, when patients display symptoms likely to prolong recovery, such as neurocognitive deficits, agitation or abulia (a lack of initiation of speech or motor activity), appropriate interventions can reduce these manifestations. This in turn facilitates subsequent therapies that otherwise could not begin, or would be less effective, until symptoms remit.

Physiatric consultation can also provide more specialized assessments, such as determination of functional impairment using an American Spinal Injury Association classification for those with a spinal cord injury, and examine whether current therapies are adequate or need adjustment.

True Teamwork

Physiatrists at Kessler interface with a wide range of critical care specialists at HUMC. Working with all trauma team members helps them determine a person’s level of neurological injury and promote behavioral management. This ensures the initiation of physical, occupational or speech therapy as soon as the individual is medically able to participate, allowing transition to the next level of care more quickly. Consultation with social service departments can help guide proper release of patients, which is particularly important given that people may be discharged to any number of care settings, not necessarily to Kessler.

Integrated Efforts

Across all providers and parties, the emphasis is on communicating and maintaining a continuum of care throughout the patient’s course of treatment. This interaction may allow Kessler to involve the acute care team more quickly if medical complications arise.

In general, the faster the restoration of motor, cognitive and behavioral functioning the greater the likelihood for a person to optimize activities of daily living, vocational or educational performance, and quality of life.

During rehabilitation. Furthermore, individuals with complex injuries frequently require additional procedures and follow-up evaluations, which are easier to coordinate when staff members from both facilities are more closely integrated.

Perhaps most important, though, clear and open communication is what underlies the intentions of all those involved to collaborate toward the same goal of restoring patients’ functioning.

Allison M. Averill, M.D., is director of NeuroRehabilitation Services at Kessler’s Saddle Brook campus and assistant professor, Department of Physical Medicine and Rehabilitation, at University of Medicine and Dentistry of New Jersey–New Jersey Medical School. She can be reached at aaverill@kessler-rehab.com.
A defining image: MRI in medical rehabilitation research and treatment

Q&A WITH NEIL N. JASEY, JR., M.D., AND MONIQUE TREMAINE, PH.D.

SCANNING OPTIONS

Both positron emission tomography (PET) and single-photon emission computed tomography (SPECT) scans produce images of brain activity and hemodynamics but differ from fMRI in their applicability to rehabilitation. PET scans are particularly helpful in evaluating molecular function but cannot differentiate between live and dead tissue. Both PET and SPECT scans require intravenous administration of a radioactive tracer or contrast dye, which limits repeat testing. fMRI uses no radiation and can therefore be applied multiple times to the same patient. fMRI also offers increased resolution in both the temporal and spatial regions. A newer technology called diffusion tension imaging (DTI) uses a sequence-run MRI to measure brain function. DTI is being utilized in research only, but may prove useful to identify and track healing in people with a concussion.

Focus on Rehabilitation: How is MRI used in treating Kessler patients?

Neil N. Jasey, Jr., M.D.: When needed to understand the extent of injury, an MRI is typically done at the acute care hospital prior to transfer. While at Kessler, an MRI may be useful if a patient has a negative change in status. For example, if someone has a functional or cognitive decline, it may be useful to examine the brain for anatomical changes, such as the expansion of an intracerebral hemorrhage, hydrocephalus, progression of a tumor, or proliferating edema. If we feel individuals need an MRI while they are here, we typically send them to either the transferring hospital or a nearby imaging center.

Monique Tremaine, Ph.D.: For neuropsychology, MRI can be useful in guiding the evaluation process and identifying the type of deficit anticipated given the pathology location. In some cases, it also helps rule in or out certain neurodegenerative processes.

Focus: Are behaviors and thought processes sufficiently mapped in the brain to help interpret the findings of an fMRI?

Tremaine: Prior studies of fMRI and other imaging technologies have substantially improved our understanding of brain behavior relationships over the past couple of decades. We currently have a rough idea of the link between the commonalities of brain geography and thought processing. However, we have yet to complete a comprehensive brain map of how thought is related to emotion and behavior, and how individual differences in these areas affect recovery after injury. The hope is to utilize fMRI to further identify and understand these relationships.

Focus: Will fMRI be able to guide treatment or gauge the response to therapy?

Jasey: For now, it can be used only to track the effects before and after an intervention. These scans will allow us to look longitudinally at the parallel between variations in brain activity and patient recovery. We hope to learn how the regions of the brain work together or whether neuroplasticity is associated with recovery. While it may take time to understand these changes, the goal is to integrate these tests into practice.

Tremaine: fMRI also may be useful in beginning to identify trends in response to therapy and someday assist in selecting suitable therapeutic approaches.
based on individual differences in brain functioning. The current tendency is to separate thought processing from emotion when considering recovery from an injury. The fMRI may facilitate identifying a more unified approach; recovery in the brain is clearly an integrated process involving individual differences in thought, behavior, emotion, cognitive reserve and plasticity.

Focus: Is it possible to get false results?

Jasey: False results are historically not common with an MRI outside of the usual interference, but we have much to learn about fMRI. You may find an occasional outcome that doesn’t fall within the usual range of expected results. These would be labeled as “incidental” findings for now.

Tremaine: Although I would not expect a false result from the image itself, a more likely error would result from the interpretation of it. For instance, if the assigned fMRI task is novel to the individual, we may see increased activity in certain brain areas and attribute it to the specific assignment rather than to the novelty of that movement. Once that task becomes routine, we may see less activity in that area, leading to conclusions that may be faulty.

Focus: Should all patients with brain injury be sent for an MRI or fMRI?

Jasey: Obviously, because of the magnetic fields, MRI cannot be used with certain patients, such as those with metal shrapnel, and must be applied judiciously in others who, for example, have a ventriculoperitoneal shunt. Aside from the contraindications, MRI may be recommended more routinely going forward. We first need research to better understand the patient-to-patient variability and determine the type of intervention, if any, that can treat the injury most effectively.

Tremaine: I would agree that more research is needed within the rehabilitation community to identify areas where routine use would be desirable. I think fMRI has significant potential, particularly when rehabilitating cognition.

Focus: Is fMRI being used in acute care hospitals or in the rehabilitation setting?

Jasey: fMRI is not currently being used in patient care at either acute care or rehabilitation hospitals, but is primarily a research tool. Kessler will be unique by having the technology available to even consider moving beyond research.

Tremaine: We hope to develop research protocols that bridge clinical care and answer questions important to rehabilitation. For example, can fMRI predict long-term impairment in people with mild traumatic brain injury? Another potential use of fMRI in the rehabilitation setting is to help predict neuropsychological outcome prior to surgery in patients with brain tumor and epilepsy. This would help drive post-surgical rehabilitation programs and allow us to better inform patients and families when assessing the risk of operating. Initially, referrals for fMRI will be based on the best fit for existing and ongoing research protocols. The goal is to generate a precedent for use of this technology in evidence-based clinical practice, which will then expand our pool of relevant referrals.

Focus: Can you share insight into the new Kessler Foundation Neuroimaging Center?

Jasey: We are proud and excited to collaborate with our colleagues at the Neuroimaging Center at Kessler Foundation, our research affiliate. Located at Kessler’s West Orange campus, this multimillion-dollar center makes us the only medical rehabilitation facility in the nation with an onsite, research-dedicated MRI scanner. This signature center will enable scientists and physicians to work together to advance rehabilitation research, particularly in the areas of cognition and mobility for individuals with brain injury, stroke, MS and spinal cord injury—and translate that to patient care.

Neil N. Jasey, Jr., M.D., is director of Brain Injury Rehabilitation at Kessler, where he also completed his residency and fellowship in brain injury. He can be reached at njasey@kessler-rehab.com.

Monique Tremaine, Ph.D., is director of Psychology & Neuropsychology at Kessler and clinical manager of the Cognitive Rehabilitation Program for Acquired Brain Injury at Kessler’s West Orange Campus. She can be reached at mtremaine@kessler-rehab.com.
Balancing act: A look at the complicated determination of a patient’s length of stay

By Bruce M. Gans, M.D.

When patients are admitted to an inpatient rehabilitation hospital/unit, one of the first considerations is to estimate how long they will need to remain to meet their goals. This assessment is important for several reasons, including managing resources (especially for facilities with limited beds), as well as the expectations of insurance companies, families, patients and professionals. It also allows the rehabilitation team to focus on goals that are achievable within that time frame.

The Physician’s Decision

Just as the decision to admit a person to the hospital is one that only the physician should make, the determination to discharge a patient is also the physician’s, albeit in consultation with the rest of the rehabilitation team, the patient and the family. Neither hospital administrators nor insurance plans, including Medicare or Medicaid, should usurp that right. Payers do not practice medicine and are rarely held liable if adverse clinical consequences occur because of a premature discharge.

Nor should family members override that recommendation for personal reasons when the patient is clinically ready to go home.

Yet we have all experienced pressure from within and outside our institutions to discharge patients as soon as possible. We seem to forget that while an insurance company can determine how much it will pay for the admission and for how long, that is not the same as deciding when care should end.

The Role of Medicare’s Measurement

The expected length of stay should be established based on the patient’s clinical needs, goals and predictions of rate of achievement, supported by expert clinical judgment, experience and evidence. Unfortunately, the Medicare’s Geometric Mean Length of Stay (GMLOS) is a mandated measure. One common misconception is that it is a blueprint for discharge planning. Instead, it is designed to estimate per diem rates for patients who are transferred or discharged early, and, therefore, do not qualify for the full prospective payment rate.

If a clinical team uses the GMLOS as a “cap,” or tries to inappropriately shorten patient stays, it is ignoring the fundamental fact that the GMLOS represents: Half of the patients are expected to remain hospitalized for a shorter period than the median length of stay and half for longer. If facilities blindly manage to the mean, it likely will be inconsistent with what is clinically appropriate. It also will become a self-fulfilling prophecy because in future years CMS will revise the GMLOS based upon observed stays and will continue to shorten the median not because of improved clinical effectiveness but because of improper truncation of clinical stays.

Resisting Unfounded Family Pressure

The length of stay also should not be determined on the basis of patient or family convenience such as a request to “keep Mom an extra two weeks until our houseguests leave.” That is as inappropriate as the patient being driven out the door by acquiescing to an insurance company that wants to save money.

Thus, it is important to remember that neither insurers nor family members discharge patients—physicians do. Since there is always some ambiguity about when any health care transition is appropriate, the medical judgment of a physician should be the final arbiter, with patient safety and the durability of treatment over the long term the primary considerations for all clinical decisions.
controversial claims as to the efficacy of laser therapy, because it did not significantly surpass placebo for a number of musculoskeletal conditions. These include acute and chronic neck pain, fibromyalgia, wound healing, carpal tunnel syndrome, epicondylitis, tendinitis, back pain, and shoulder pain from subacromial impingement syndrome. In fact, for spinal pain specifically, laser intervention may not be effective because of the inability of even the highest-powered lasers to penetrate the spine adequately. Of note, there is no evidence to suggest that laser therapy is unsafe or exacerbates musculoskeletal dysfunction (see “What Does the FDA Say?”).

The main cause of mixed findings has been attributed to significant variations in the quality and methodology of published studies. This includes inconsistent use of controlled versus open clinical trials; a tendency to compare laser treatment with placebo but not with established therapies, such as transcutaneous electrical nerve stimulation; small sample sizes; errors in data reporting; lack of statistical power; omission of follow-up periods; and failure to account well enough for outcomes based on dosage, wavelength, power/intensity, light frequency, or duration of each treatment.

### Controversial Claims

Along with questions about its overall efficacy, possible mechanisms of effect of laser treatments also have been subject to debate. Specifically, questions linger as to whether effects are primarily thermal or photochemical. Reduction of pain and swelling can be achieved by application of cold or heat, which can reduce muscle tightness, loosen connective tissue and increase blood supply. Thus, improvement in the functioning of soft tissue structures like muscles, ligaments and tendons due to greater blood flow seems plausible; but what about the ability of lasers to repair bone and soft tissue structurally? This is where the evidence is more dubious.

Numerous suggested possible mechanisms are worthy of further study but, at this point, lack rigorous data from randomized, controlled trials to be substantiated as fact. Some researchers claim that photons emitted during laser therapy enhance the production of adenosine triphosphate, helping to restore normal cell functioning. Others suggest anti-inflammatory effects occur not merely from increased blood flow but by inhibiting histamines and pro-inflammatory cytokines such as tumor necrosis factor and interleukin-1. Laser-induced pain relief due to endogenous opioids and neurotransmitters, including acetylcholine and serotonin, also lack clinical support.

It has been further postulated that lasers stimulate or modulate mitochondria, thus increasing energy levels. Finally, statements about laser therapy facilitating cell proliferation, collagen synthesis, protein and prostaglandin synthesis, angiogenesis and tissue reparation all should be considered speculative at this point.

### Moving Forward

Although positive findings do exist for a limited number of well-designed studies, the consensus is that greater research with significantly improved methodologies is needed—namely, consistent reporting of standardized outcomes and application. With the advent of higher-powered lasers capable of greater and varying patterns of output, research into mechanisms of effect likely will continue.

Musculoskeletal disorders affect millions of Americans, impinge on their functioning and quality of life, and are a drain on our country’s health care system. Alternative modalities to alleviate pain, suffering and excess use of resources are certainly desirable.
Meeting of the minds for safety and quality

BY BRUCE POMERANZ, M.D., MMM, AND JOAN ALVERZO, R.N., CRRN, PH.D.

SINCE THE Institute of Medicine issued its report on medical errors in 2000, safety has been a national focus in hospitals and outpatient care. Advancing clinical practices and improving policies and procedures can influence safety and quality significantly, along with employee attitudes and environmental factors. Within the rehabilitation community, however, national conferences have not addressed the special challenges faced by hospitals and providers.

Select Medical and Kessler Institute for Rehabilitation sought to fill the void by sponsoring The First National Summit on Safety and Quality for Rehabilitation Hospitals, held May 21–22, 2013, in Washington, D.C. Inspired by a theme of Listen, Share, Learn, leading experts discussed best practices and strategies for improvement in the rehabilitation setting and the entire continuum of care with colleagues from across the country.

Getting Specific

Attendees included physiatrists, physicians, nurses, administrators, risk managers, safety officers and others from inpatient rehabilitation hospitals/units (IRH/Us), as well as policymakers and other stakeholders. During talks and breakout sessions, participants defined quality metrics and strategies to measure and track quality data, and analyzed the challenges and solutions facing clinicians and leaders. Tactics to improve safety and quality in their own IRH/Us were evaluated.

Bruce M. Gans, M.D., welcomed the audience in the opening session and set the tone for the remaining agenda. With a history of advocacy for the field of rehabilitation, Gans has long promoted best practices for IRH/Us. He began an important dialogue among rehabilitation providers that is expected to raise additional issues and lead to more conferences and work in this area.

A Variety of Presenters

Highlights from the groundbreaking gathering include:
• A powerful keynote address by Sorrel King, the mother of a child who died because of medical errors. Stressing the importance of communication, she encouraged her audience to create systems that will improve safety and quality across the care continuum.
• Presentations by individuals from several policymaking organizations. Carolyn Clancy, M.D., the director of the Agency for Healthcare Research Quality, and Christine MacDonell, the managing director of CARF International, described how the organizations speak to the needs of rehabilitation hospitals.
• A second keynote address by Thomas A. Scully, an attorney and a former administrator of the Centers for Medicare & Medicaid Services. Scully spoke about the relationship among patient safety, quality, outcomes and satisfaction, as well as the impact of safety and quality on overall operations.

A detailed review of the conference presentations will be included in the fall issue of Focus on Rehabilitation.

Bruce Pomeranz, M.D., MMM, is medical director for Kessler and chief quality officer at Select Medical, and is board-certified in physical medicine and rehabilitation, pain medicine and electrodiagnostic medicine. He can be reached at bpomeranz@kessler-rehab.com.

Joan Alverzo, R.N., CRRN, Ph.D., is vice president of clinical operations and quality for the inpatient rehabilitation division of Select Medical. She can be reached at jalverzo@kessler-rehab.com.