

Focus on Rehabilitation

A PUBLICATION FROM THE KESSLER REHABILITATION CORPORATION

New pharmacological approaches in treating difficult patients with acquired brain injury

Today, effective pharmacological alternatives can help manage the acquired brain injury patient who does not respond to conventional treatments.

Jonathan L. Fellus, M.D.



The ultimate goal for treating acquired brain injury patients is to sustain them on conventional regimens that do not necessarily involve medications. These regimens include using behavior modification, restructuring the environment (i.e., providing a low-stimulus environment for the overstimulated patient) and redirecting the patient when needed (such as engaging patients for shorter periods of time if they become frustrated or experience loss of attention during therapy). Physical restraints may also become necessary for some patients who are overaroused.

For the patient who does not adequately respond to these approaches, however, the next line of therapy involves pharmacological approaches that can greatly help the overaroused or underaroused patient benefit from rehabilitation. Too often, healthcare providers believe the “difficult” patient chooses not to cooperate and is therefore not a candidate for rehabilitation. In reality, difficult-to-manage behavior usually stems from chemical or physical changes in the brain that cause post-traumatic fatigue, depression and a range of irregular behaviors—all of which may respond well to pharmacological interventions.

Treating underaroused and unmotivated patients

If the patient is unable to participate in therapy after a few days of conventional nonpharmacological treatment, the next step is to regularize the patient’s sleep/wake cycle, if needed. This is achieved by using stimulants during the day and/or sleep aids at night. If the patient is still underaroused once the sleep/wake cycle is regularized, the cause could be a lack of chemicals that

Usually, difficult behavior stems from changes in the brain that may respond to drugs.

drive motivation and arousal—mainly dopamine. Patients can therefore benefit from the modulation or potentiation of dopamine (i.e., giving dopamine agonists to overaroused patients and stimulants or dopamine drugs, or both, to underaroused patients). Dopamine agonists and stimulants also have a broad effect on chemicals related to dopamine, mainly norepinephrine.

Selegiline (5–10 mg given in the morning) and bromocriptine (5–100 mg divided into two daily doses) are both effective at increasing arousal, and there is mounting evidence that they improve motor and

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LETTER FROM THE EDITOR

The patient is a human being

Bruce M. Gans, M.D.



“An interesting *ear* came into my office today.” I overheard those words as a college student. The speaker was the surgeon in charge of an otolaryngology department research lab. I had taken a job there for the summer to learn about the medical world I planned to enter.

Ears don’t often travel on their own, and I was pretty sure this one hadn’t either. It struck me that that surgeon had so depersonalized the object of his labors that he no longer thought of himself as taking care of a *person*, but only of the organ he was working on. I said to myself, “No matter what I do in medicine, I’m never going to forget that I’m dealing with human beings.” Thirty-five years later, I am reminded of that experience by what I see happening to us in medical rehabilitation.

Today there are forces that threaten more than ever to obscure the simple fact that we take care of people. In many ways, modern technology lets us keep our distance from patients. We can take images instead of doing a physical exam. We are starting to be able to treat with telemedicine and remote care, so that in some cases we need not even be in the same city, let alone touch the

“We should refer to
people, not diseases, and
refer to them by name.”



patient. We also face enormous pressure from the economic system to move patients through our systems of care more quickly and hence spend less time with them. Then there’s the new hospitalist model of care, in which a patient “belongs” not to a particular physician, but to a series of clinicians who operate like shift workers.

All of these trends threaten our ability to relate to and understand our patients as people rather than as organ systems or disease entities.

My fear is that we will lose our awareness that what we see before us is a *person* in crisis. By definition, we in rehabilitation care for people who have had a catastrophic event befall them, whether it is an illness, an injury or a birth disorder. If we see patients only as objects, diseases or economic units, we risk failing to satisfy their real needs and losing the ability to advocate for them properly. We endanger the value system of our specialty, which is based on recognizing people as individuals who function in their community.

I believe we must keep in mind that underneath all our process and all our paper there’s a person—not a pesky, burdensome claimant on our time, but the very reason our programs and systems exist.

We can do some concrete things in this effort. We can remind ourselves and our subordinates that every decision, every process and every program is aimed at helping individuals. And we can be careful about the language we use. We should refer to people, not diseases, and refer to them by name, not by number, bed assignment or economic category or consequence. We can remember to treat everyone with the respect we ourselves would want—and that means not only patients, but also their families, our professional colleagues and even third-party representatives.

Doubtless that surgeon I overheard long ago was technically proficient. And he may not even have realized that his words reached my still-attached ears. But I think we should avoid the trap of depersonalization into which he fell. Keeping our focus on the patient’s humanness, I believe, will be more satisfying in the end and will drive us toward the highest-quality medical outcomes.

—Bruce M. Gans, M.D., Editor-in-Chief



Coming soon: Practical electrical stimulation therapy for stroke patients

FDA approval is expected soon for an implantable device that promises to improve the treatment of subluxation and pain in patients with post-stroke shoulder paralysis.

Elie Elovic, M.D.

Among the 600,000 Americans who have strokes each year, at least 75 percent suffer some paralysis. Often, paralysis affects the muscles that control the shoulder, leading to subluxation and severely impaired arm function. Loss of shoulder mobility becomes a vicious cycle: The longer muscles stay idle, the more they atrophy and the more the shoulder dislocates, as withered muscles can no longer hold the humerus in its socket. That leads to less function and more pain for the patient. In fact, more than 80 percent of paralyzed patients now report post-stroke shoulder pain.

Functional electrical stimulation (FES) therapy uses electricity to stimulate muscles and nerves, replacing the electrical impulses from the brain that once “fired” muscles with targeted electrical current. But clinical FES applications for stroke, which so far have relied on surface electrodes, have been very limited. Proper placement of the electrodes on the skin requires training. When performed daily by a therapist, FES can be costly and inconvenient. Yet when family members apply electrodes, there is a high risk of incorrect placement, resulting in loss of benefit or even injury.

In addition, relatively high amounts of current must be applied to the skin to penetrate to the muscles where it’s needed. That only adds to patients’ discomfort and discourages them from seeking or continuing therapy.

But many of the hurdles keeping FES from wider use are about to be cleared. Kessler’s research branch is one of a handful of facilities in the nation that have just finished testing a new generation of implantable FES technology. We’ve seen excellent

results: Patients report greatly reduced pain and improved shoulder function and movement. With FDA approval expected, the device—the Neuro-Control RestoreStIM System—will soon be available in rehabilitation centers around the country. It will also, we think, greatly improve our ability to treat subluxation and shoulder pain in the clinical setting.

Here is how the system works: With local anesthesia, four flexible electrodes are implanted in the muscles around the shoulder, one each in

“Physicians will no longer have to prescribe ever higher doses of pain medication to manage stroke patients with impaired shoulders.”

the middle deltoid, posterior deltoid, upper trapezius and supraspinatus muscles. The electrodes, which are attached by titanium wires to a portable device the size of a beeper, stimulate the muscles six hours a day for six weeks while the patient is engaged in routine activities.

Because the electrodes are implanted, patients no longer have to worry about their placement, and the current used is much more targeted—and in a much lower amount—than in previous FES therapy. The constant application of current contracts the shoulder muscles, building them up over time and making muscle fiber more dense. That allows the muscles to hold the shoulder in place, cutting subluxation, reducing pain and lowering the need for pain medications with their associated side effects.

FDA approval should open the way for insurers to cover both the device and the therapy—and signal the start of a new partnership between rehabilitation centers and community clinicians. While rehab physicians will still need to implant and adjust the device, the implications for clinicians and therapists are far-reaching. As function improves and pain diminishes, stroke patients will become candidates for many other types of physical therapy and rehabilitation that are currently not an option for them. And physicians will no longer have to prescribe ever higher doses of pain medication to manage stroke patients with impaired shoulders.

Treating shoulder paralysis may be just one of many applications for the device. Because stimulating muscles may make them more resistant to decubitus ulcers, it might be used to help prevent skin breakdown in patients with spinal cord injuries. The same device could reverse the wasting of leg muscles and help some stroke patients walk again.

Implantable FES will not be for everyone. Patients with unstable seizures, pacemakers, arrhythmia or bleeding disorders should not be outfitted with the device. And we do not yet know if one-time treatment is a lifetime fix or if the FES therapy will need to be repeated every few years. But we do know that reducing shoulder pain and dislocation greatly improves stroke patients’ quality of life. For them and their physicians, that is a promising start. **FOCUS**

Elie Elovic, M.D., is co-director of traumatic brain injury research at the Kessler Medical Rehabilitation Research and Education Corporation.

An Interview with Steven Kirshblum, M.D.

A new subspecialty gets its textbook

Published this year, *Spinal Cord Medicine* doesn't just describe issues with their pros and cons. It takes a stand.

It seemed like a simple proposition: assign experts in spinal cord medicine to produce chapters on the topics of their expertise, write a few chapters yourself, then compile the results as an authoritative textbook. Kessler's Steven Kirshblum, M.D., took on that challenge, along with fellow editors Denise L. Campagnolo, M.D., and Joel A. DeLisa, M.D., M.S., and *Spinal Cord Medicine*, published this year, is the result. *Focus on Rehabilitation* spoke with Dr. Kirshblum recently about the volume and its creation.

FOCUS: What was the genesis of your book?

KIRSHBLUM: Spinal cord medicine didn't really come into its own until 1996, and it still lacked a single comprehensive textbook. I had been asked to edit one and had declined because of other commitments. Then I decided to make it a priority.

FOCUS: For whom is it intended?

KIRSHBLUM: Two groups, really. For specialists in spinal cord injury, it's a reference text. For clinicians outside the subspecialty, it's a source for answers to questions. I wrote a number of the chapters and asked recognized experts around the country to write about areas in which they excel.



Even a book with many authors needs a single voice, says Steven Kirshblum, M.D.

The book is organized according to a blueprint for the subspecialty created by the American Board of Physical Medicine and Rehabilitation. That way, it tries to cover everything in the subspecialty from A to Z.

FOCUS: What kind of direction did you give chapter authors?

KIRSHBLUM: "Make it easy to read, clinically pertinent and useful, with clear recommendations as to treatment so that things aren't left up in the air." The difference between a text and a

review paper, I think, is that a review paper will give all the options and leave the reader to make the ultimate decision. In the text we try to explain all the options, but also give an expert opinion as to how one should manage a case in certain scenarios—in a way, applying the art as well as the science of medicine.

FOCUS: What do you do with a clinical area in which there are divergent views about treatment?

KIRSHBLUM: We explain the divergent views, but still try to come up with a recommendation. For example, on pages 148–149 we discuss means of weaning patients from ventilators. We mention both synchronized intermittent mandatory ventilation (SIMV) and progressive ventilator-free breathing, but we also cite literature in support of our preference for the latter. It's more often successful with spinal cord injury patients, partly because SIMV requires a low tidal volume in order to work, and low tidal volume can cause atelectasis and make breathing more difficult.



Spinal Cord Medicine (ISBN 0-7817-2869-X, with 672 pp. and 282 illustrations) is available from Lippincott Williams & Wilkins for \$139. Look online at lww.com or dial 1-800-638-3030. The book is edited by Steven Kirshblum, M.D., associate medical director of the Kessler Institute for Rehabilitation and director of its spinal cord injury program; Denise L. Campagnolo, M.D., clinical director, spinal cord injury program, University of Medicine and Dentistry of New

Jersey—The University Hospital, Newark, N.J.; and Joel A. DeLisa, M.D., M.S., president and CEO of the Kessler Medical Rehabilitation Research and Education Corporation. All three editors are in the Department of Physical Medicine and Rehabilitation at the University of Medicine and Dentistry of New Jersey—New Jersey Medical School, where Dr. DeLisa is chairman and professor and Drs. Campagnolo and Kirshblum are associate professors.

One way to evaluate clinical competence

Joel A. DeLisa, M.D., M.S.



How do you ensure the clinical competence of physiatry residents? Since 1992, that question has been a priority for

both the Kessler Medical Rehabilitation Research and Education Corporation (KMRREC) and the New Jersey Medical School Department of Physical Medicine and Rehabilitation.

One answer is the objective-structured clinical examination (OSCE). It is a set of planned clinical encounters in which residents interview, examine, inform or otherwise interact with standardized patients who are rehearsed to portray actual patients. They may be able-bodied persons who simulate specific symptoms or clinical findings, or actual patients with relevant conditions.

The OSCE is a standardized format used to test how residents take patient histories, perform selected aspects of the physical examination (e.g., shoulder, knee, back), communicate with patients and show mastery of technical skills. It's a way of assessing how effective residents are at problem solving, decision making and the management of patients undergoing physical rehabilitation. There are 25 cases available to evaluate this array of clinical skills, of which 10 to 12 will be used in a given test. Knowledge of medical ethics is also tested by simulated situations; for example, the resident might be called on to convey sensitive information to a patient or family, or deal with a family member who disagrees with the physician's recommendation.

The resident's performance at each station is evaluated both by the standardized patient and by the faculty. One of the questions posed to the standardized patient is, "Would you

choose this person as your physician?" The responses are valuable not only to the residents, but also to the faculty, who use them to identify areas where training needs to be improved.

Feedback from the OSCE program enables us to enhance our training regimen and to evaluate the clinical competence of our trainees. In 2001, the OSCE was placed on the KMRREC website (www.kmrrec.org/osce), which is linked with that of the Accreditation Council of Graduate Medical Education. This has established our department at the New Jersey Medical School

One of the questions posed in the OSCE to the standardized patient is, "Would you choose this person as your physician?"

as a national leader in evaluating physician competence.

Our department is also adapting interactive media to enhance the curriculum. With the help of Paul G. Ranky, Ph.D., of the New Jersey Institute of Technology, we are developing educational compact discs showing three dimensions, designed to augment the teaching of clinical skills. The initial module focuses on the clinical evaluation of the patient with low back pain. This CD will link anatomy with physical examination and laboratory tests, including imaging studies and EMGs.

Our progress with the OSCE and our embrace of interactive media underscore our commitment to well-rounded, quality education in physical medicine and rehabilitation. **FOCUS**

Joel A. DeLisa, M.D., M.S., is president and CEO of the Kessler Medical Rehabilitation Research and Education Corporation.

FOCUS: Does *Spinal Cord Medicine* also address today's world of managed care and cost containment?

KIRSHBLUM: Yes. For example, we state on page 279, "It is no longer possible to achieve all of the rehabilitation goals in the fewer rehabilitation days that are being certified by third-party payers." The point, of course, is to assure effective and safe discharge planning so that rehabilitation can continue after the inpatient stay.

FOCUS: How long did the book take to produce?

KIRSHBLUM: From start to finish, about two years. I edited every chapter, even the ones that had been handled by my co-editors, because I wanted to make sure the book would flow and have a consistent tone. I also put in cross-references where appropriate and made sure recommendations did not clash where the same topic came up more than once. Some chapters needed a lot of editing, others very little. But that's part of the challenge with a textbook—trying to find the flavor that will work for the reader.

FOCUS: Did it take time from your clinical duties at Kessler?

KIRSHBLUM: No, but it took away from home responsibilities. My wife was pretty clear when she said, "If there's a second edition, there's a second wife." I think that as time goes on she will ease up and forgive me, though. She's a wonderful person.

FOCUS: Has the book been received favorably so far?

KIRSHBLUM: Yes. I've gotten a lot of e-mails and letters saying "Thanks."

FOCUS: What have you learned from doing this book?

KIRSHBLUM: Nothing is as easy as it seems. When I finished this, the first thing I did was write a children's book for families with spinal cord injury, which is currently being illustrated. I found that much easier, and it was a tremendous amount of fun. **FOCUS**

The new PPS may help solve an old problem

Bruce M. Gans, M.D.



Medicare's new Prospective Payment System (PPS) for inpatient rehabilitation services was introduced January 1, and reportedly

up to 40 percent of rehab hospitals have begun to be paid under it. As you know, it bases reimbursement for each patient on his or her functional status, age and medical complexity using case-mix groups (CMG). Thus, the system can predict with fair accuracy the time and resources required to treat most patients in rehabilitation.

Besides changing the incentive structure for rehab hospitals, the system will create an enormous database of our patients, with case-mix adjustment data and details about care, complications, lengths of stay and outcomes.

For our specialty, the new system would herald a major sea change even if it were limited to Medicare, a program that pays for roughly half of our patients. But it won't be. Commercial insurers and state Medicaid programs are likely to adopt very similar methodologies. That means the ramifications of the new PPS cannot be escaped. For us, they include both a challenge and an opportunity.

The challenge is, simply, to get it right. The system tends to unravel a bit at both ends—very high complexity and very low. At these extremes, where cases are fewer, the averaging on which predictions of resource use depend becomes weaker and less accurate. We need to perform and support further research and analysis aimed at improving the system's ability to fairly determine reimbursement in both our least demanding cases and our most complicated ones.

The data set created by the new PPS could also give us an opportunity

to solve one of our biggest problems: the definition of a rehabilitation hospital used by the Centers for Medicare and Medicaid Services, known as CMS.

Today's definition dates back to 1983, when Medicare introduced its PPS of diagnosis-related groups (DRGs) for acute-care hospitals as a way to meaningfully relate their mix of cases with the resources expended in treating them. Rehabilitation hospitals were left out of the DRG system because no one knew how to create such case-mix groupings for rehab diagnoses. They continued to be paid by a cost reimbursement methodology

“The answer is not to slam the door on patients because of an old napkin.”

that we call the TEFRA system.

To determine whether a facility should be reimbursed under the DRG system or by the cost reimbursement method, eligibility criteria for rehab hospitals and units were devised. Surprisingly, some of those criteria were developed in quite an informal way. Conversations between physiatrists at the back of the hall at a meeting with the CMS's predecessor, the Health Care Financing Administration, led to a listing of the common diagnoses treated in rehab hospitals and units. The notes from that conversation—reportedly recorded on a napkin—ultimately became the list of 10 diagnostic categories that were used as benchmarks to define a rehabilitation hospital.

Never based on hard data, these diagnostic categories have become even less appropriate over time. For example, the diagnoses did not include patients being rehabilitated following major joint replacement operations—a large proportion of the

patients in rehabilitation facilities today. In 2002, many Medicare Fiscal Intermediaries commonly deny coverage of such cases under medical need determinations and challenge the categorization of these patients under the polyarthritis code.

The result is that there is an urgent threat to the eligibility of true rehabilitation hospitals to participate in the Medicare program as such. Many facilities may not have the required 75 percent of their admissions falling within the approved diagnostic categories—because the list of those categories is unscientific and out of date. If most rehabilitation hospitals and units were excluded from Medicare because of this outdated methodology, severe access problems for Medicare patients would result.

Of course, the CMS wants to make sure resources are used prudently. It knows that as members of the Baby Boomer generation approach the retirement years they will need thousands of new knees and hips, and that will be costly. Surely we need to be as diligent and innovative as we can about using resources efficiently. But the answer is not to slam the door on patients because of an old napkin.

Watch for mail from specialty societies such as the American Academy of Physical Medicine and Rehabilitation and trade associations like the American Medical Rehabilitation Providers Association. If they don't carry the day with the CMS, a grass-roots campaign may need to be aimed at Congress.

The new PPS system should yield the data to establish more accurate definitions of what we do. In this case, truly, knowledge is power. **FOCUS**

Bruce M. Gans, M.D., is executive vice president and chief medical officer of Kessler Rehabilitation Corporation.

New pharmacological approaches for difficult patients with brain injury

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language recovery as well. The reverse is also true: Drugs blocking dopamine slow recovery and worsen overall outcomes.

Treating with stimulants

Stimulants are also useful for giving the underaroused patient more energy and can increase the chemicals that affect drive, arousal and attention. Because cognition, behavior and attention all intersect and interact, and because these drugs are not "pure" in their effect, they can influence any of these elements. Generally, however, dopaminergic drugs are administered to increase initiative and drive, and stimulants are used to increase arousal levels.

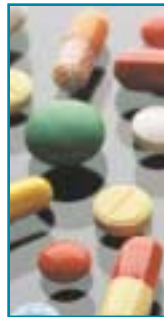
Two useful stimulants are methylphenidate and dextroamphetamine (5–30 mg per dose, for both drugs). Because these medications have short half-lives, it's important to time dosing with therapy sessions, and both drugs should be given in the morning and at noon. Dosages that are high enough to disrupt sleep should be avoided.

A newer and more specific first-line option for combating post-traumatic fatigue is modafinil (200 mg, given in the morning). Once therapy is begun, dosages should be adjusted appropriately, and methylphenidate or dextroamphetamine may be added to the regimen to improve arousal.

Modafinil, which has been used for brain injury only in the past two to three years, offers a number of improvements over the older stimulants: It appears to target more specific centers in the brain; it is not addictive; it has fewer side effects than methylphenidate and dextroamphetamine; it is easier for physicians to prescribe in the outpatient setting and it may even improve cognition. For patients with cardiac problems, hypertension or a significant drug-

addiction potential, modafinil is certainly the first drug of choice.

The cost of modafinil is considerably higher than that of the older stimulants, but the trade-off in fewer side effects and shorter hospital stays makes it a cost-effective alternative to older stimulants. Modafinil is only FDA-approved for narcolepsy, however, and many insurers reject its use for brain injury patients.



Before starting new medications, assess the patient's current regimen and eliminate contraindicated drugs.

Treating depression

Depression may also be a significant contributing factor for the underaroused patient; in fact, every brain injury patient should evoke a high index of suspicion for depression. The actual damage to the brain can cause depression, as can the patient's psychological reaction to the resulting disability. In addition, there are a disproportionate number of psychiatric disorders in patients who sustain brain injuries, and some patients sustain damage from failed suicide attempts. (Mood disorders and a medical basis for low arousal, such as thyroid deficiency or a blood clot in the brain, must always be ruled out as a cause of depression as well.)

For the underaroused, depressed brain injury patient, antidepressants with stimulating properties are most effective. These include venlafaxine (75–110 mg, twice a day) and bupropion (100–200 mg, twice a day). Trazodone (50–75 mg four times a day) is useful for treating the agitated depressed patient.

Managing the patient who is overstimulated

In addition to depression and underarousal, brain injury often leads to aggressive and agitated behavior, which is not only self-destructive, but also greatly impedes rehabilitation.

Two newer antipsychotics are more specific to brain behavior targets than older drugs such as haldol. These are risperidone (up to 6 mg once a day) and olanzepine (5–20 mg once a day, taken at night), and both have fewer side effects than older antipsychotics. They are also more expensive, but more cost-effective as well because they can reduce lengths of stay and maximize the benefits of rehabilitation therapy.

Drugs to avoid for brain injury patients

Before beginning new medications, it's important to assess the patient's current regimen and eliminate contraindicated drugs. Whenever possible, the goal is to exploit the dual action of medications and simplify the drug regimen. If a patient with seizure disorder is on a particularly sedating anticonvulsant, such as phenobarbital, for instance, the recommended drug would be carbamazepine, lamotrigine or valproic acid. These latter drugs work not only as anticonvulsants but as mood stabilizers as well.

Also, if the overaroused patient must take an anticonvulsant, a change from phenytoin to another anticonvulsant with the desired activity can be useful. In addition, the anticonvulsant divalproex can act as a mood stabilizer and treat migraine. The newer anticonvulsant oxcarbazepine can also be useful as a mood stabilizer.

Specific drugs to avoid for all brain injury patients include haldol, benzodiazepines, phenobarbital, metoclopramide and anticholinergic drugs. **FOCUS**

Jonathan L. Fellus, M.D., is director of brain injury services at the Kessler Institute for Rehabilitation.



Clinical Pearls

Beyond mobility: Optimizing outcomes for joint replacement patients

Bruce A. Pomeranz, M.D.

The often-discussed goal of “walking independently” is hardly sufficient for individuals after a hip or knee replacement. Crucial objectives include optimized long-term mobility as well as prevention of long-term musculoskeletal complications. Without adequate rehabilitation to optimize extension after total knee replacement, for example, patients can face permanent limitations in range of motion, premature fatigue with ambulation, suboptimal gait pattern, pain and diminished function. Indeed, all joint replacement patients risk poor long-term outcomes—including damage to the replaced joint and personal injury—without proper rehabilitation, follow-up and discharge planning.

■ **Patient assessment:** The rehabilitation team must first assess the unique details of each replacement procedure. A full medical history should include: Which components, if any, were cemented during the procedure? What is the patient’s weight-bearing status? Was this a revision surgery? Were associated procedures such as a tendon lengthening also performed? What is the status, both subjectively and objectively, of the other joints and the overall musculoskeletal system?

■ **Pain management:** Ineffective pain management will not only cause unnecessary suffering, but also prevent the patient from gaining the full benefit of rehabilitation. The use of long-acting pain medications (such as long-acting morphine or oxycodone or a fentanyl transdermal patch) can provide sustained relief; this may decrease the frequency of individuals waking at night

because the pain medicine “wore off.” Treatment for constipation (stool softeners) should begin prophylactically when opioids are prescribed, and an anti-emetic should be available to treat nausea if needed.

Short-acting opioid pain medications are effective for managing breakthrough pain. In addition, short-acting pain medications taken prior to therapy can optimize range-of-motion exercises and other potentially painful therapies.

The entire rehabilitation team should assess the patient’s pain level daily. Systematic procedures for communication of this information to the physician will ensure adequate pain control.

■ **DVT and PE prevention:** To avoid tragic—and preventable—mortality, prophylaxis for deep-vein thrombosis (DVT) and pulmonary embolism (PE) is vital. Prophylaxis includes mechanical means, such as compression garments and early mobilization. Pharmacological methods include low-molecular-weight heparin or Coumadin. Treatment regimens vary, but tend to range from two to six weeks after surgery. Evidence favors prophylactic regimens that often extend beyond hospitalization. Drug therapy requires monitoring and is a key component of medical management and discharge planning.

■ **Promote independence and safety:** Individualized functional goals should be developed in view of the patient’s home situation, support system, overall health status and vocational and avocational interests. Regaining mobility and strength, maintaining range of motion and achieving functional independence

all require individualized interventions based on these assessments.

Particularly after hip replacement, patients must also learn to integrate precautions into their day-to-day lives at home. For safe and independent function, they must be taught to move properly and to use adaptive equipment, such as raised seats and reachers.

■ **Wound management:** Another important role of the rehabilitation team involves wound monitoring and management, for both the surgical wound itself and the skin in general. Sacral and heel breakdown may develop in these patients if care is inadequate.

■ **Nutritional and exercise interventions:** Management also includes nutritional interventions, such as promoting weight loss to preserve remaining joints and new prosthetic ones. A healthy diet, perhaps with iron supplementation, may facilitate healing, address post-operative anemia in the short run and, combined with a commitment to exercise, promote musculoskeletal and general health in the long term. Low-impact exercise, such as swimming and cycling, is to be encouraged.

■ **Comprehensive discharge planning:** The discharge plan is critical to successful long-term outcomes. An individualized discharge plan will meet the patient’s pharmacological needs, such as for pain and DVT prophylactic drugs, and include a home exercise program to continue rehabilitation after discharge and a schedule for ongoing therapy and follow-up. Given today’s brief hospital stays, skilled interdisciplinary management and detailed, well-coordinated plans across the rehabilitation continuum are more critical than ever. **FOCUS**

Bruce A. Pomeranz, M.D., is associate medical director for the Kessler Institute for Rehabilitation.