be), we will continue collaborative efforts to improve patient function through evidence-based treatments.

Jose A. Ramirez-Del Toro, MD
Director of Sports Medicine and Spine Care, The Orthopedic Group PC
Director of Sports Medicine, California University of Pennsylvania
Clinical Instructor, University of Pittsburgh Medical Center, Department of PM&R

Francois Prizinski, DPT, OCS, DAC
Staff Physical Therapist, The Orthopedic Group PC
Fellow, Sports Medicine of Atlanta's Orthopedic Manual Therapy Fellowship Program

Disclosure: nothing to disclose

http://dx.doi.org/10.1016/j.pmrj.2012.04.008

REFERENCES

1. Haig AJ, Adewole A, Yamakawa KSJ, et al. The ligament flavum at L4-5: Relationship with anthropomorphic factors and clinical findings in older persons with and without spinal disorders. PM R 2012;4:23-29.
2. Haig AJ, Tong HC, Yamakawa KSJ, et al. Spinal stenosis, back pain, or no symptoms at all? A masked study comparing radiologic and electrodiagnostic diagnoses to the clinical impression. Arch Phys Med Rehabil 2006;87:897-903.
3. Fritz M, Cleland JA, Childs JD. Subgrouping patients with low back pain: Evolution of a classification approach to physical therapy. J Orthop Sports Phys Ther 2007;37:290-302.
4. Whitman JM, Flynn TW, Fritz JM. Nonsurgical management of patients with lumbar spinal stenosis: A literature review and a case series of three patients managed with physical therapy. Phys Med Rehabil Clin N Am 2003;14:77-101.
5. Creighton DS, Krauss J, Marcoux B. Management of lumbar spinal stenosis though the use of translator manipulation and lumbar flexion exercises: A case series. J Manual Manipulative Ther 2006;14:E1-E10.

REPLY:

I am grateful that Drs. Ramirez-Del Toro and Prizinski have done an insightful job of putting my team's work into the context of "the big picture" in their letter regarding our most recent publication [1]. The letter requires a few technical responses but also calls for a rational approach to spine science and practice that is even more critical.

First, I will address the technical issues. Regarding needle electromyography (EMG) as an outcome measure, I do not believe that needle EMG, including our team's paraspinal mapping, is a good outcome measure for spinal stenosis. Pathophysiologically, the fibrillation potentials detected are the consequence of stenosis that is "bad enough" to cause axonal loss in addition to the severe but transient neurapraxia that more clearly defines neurogenic claudication. Fibrillations, as detected on EMG, are the result of Wallerian degeneration of the nerve, leading to degeneration of the neuromuscular junction and destabilization of the muscle cell membrane so that it fires spontaneously, much like cardiac or smooth muscle. There is a long and complex chain of events between removal of the offending lesion and implantation of a new neuromuscular junction in the muscle cell. This new junction can come from sprouting neighboring axons as much as from regrowth of the originally damaged axon from the root level.

From a more empirical perspective, we found that EMG findings, including paraspinal mapping, did not predict pain or function at more than 18 months after the initial evaluation in one population [2]. EMG is a good diagnostic test, but in the context of that study, it was not a good prognostic test. Therefore it's probably not a good outcome measure, either.

Regarding flexion exercises for stenosis, it makes sense that flexion exercises, advocated by the authors, would work for spinal stenosis. However, this opinion is a far cry from level I evidence-based medicine and even further from "standard care taught to every therapist and doctor and preferred over hot packs and massage in every reasonable clinic." Maybe that's not as technical a response as I intended, but it's a good transition. Their letter raises much more important issues. Why do surgeons operate so much? Why do therapists use passive modalities so much? Why do some physiatrists perform 3-in-a-row epidurals? Why do other physicians throw drugs at elderly patients' pain when they can only relieve perhaps one third of the pain? How could doctors have placed so much faith in spinal imaging over all these years when it is now clear that all of the measures they have used are a house of cards? An insightful approach will look at how we (the aggregate) have been taught and how we change our clinical habit—that is, a nonlinear approach. My thoughts on this issue have been strongly influenced by John "Jack" Peirce, MD, MS, a retired private general internist with advanced degrees in medical education and scientific methodology. During his 50+ years of private practice, he has been ahead of the cutting edge in clinical care. He built the first family practice residency in the western part of Michigan and held team meetings and measured functional outcomes in the days when even most PM&R doctors weren't doing it.

Jack's got it right. Medicine is nonlinear. Academic medicine got pretty far by cheating on this process in the later 20th century by thinking linear. Polio, hypertension, and hip fracture repair have been substantially improved by research that assumes we all are 5'10" white men with a hemoglobin count of 14 ± 1.3 who don't want to live in a nursing home. Because of this linear mindset, when we teach or write practice guidelines, we still ask simplistic, reductionist questions. The limitations of 20th-century medicine are obvious. The solutions also are obvious. We

have been advocating for them for years. Recursive holistic assessment processes for back pain that use intelligently designed frameworks and transdisciplinary team intelligence work [3]. Recently Christy Tomkins and I wrote a commentary for *JAMA* describing a rational process rather than a single test to "diagnose" the disease [4]. These processes are reproducible and researchable. Yet the National Institutes of Health and other policymakers have paralyzed the advancement of care for real people in the next 2 decades because they can't reconcile their 20th-century mindset with our country's 21st-century needs, budgets, and time frames. Jack believes that the future of medicine is exactly what we physiatrists do: build a culture of care. Work with the other physicians as a team. Look at the patient's goals, not the standard metrics. Share the planning and decision making with the patient. It's old-time medicine, and it has been tossed out with the statistical games of the past 50 years.

It is heartening to see that Drs. Ramirez-Del Toro and Prizinski's letter reflects distress about our old ways. Fortunately, a lot of very influential 21st-century experts are catching up with old Dr. Peirce [5-7]. For now, we can play the reductionist game if it gets us funding. However, we need to insist on teaching and researching the complex recursive process in spinal care or our patients and our society will suffer.

Andrew J. Haig, MD
Physical Medicine and Rehabilitation
The University of Michigan
Ann Arbor, MI

A.J.H. Disclosure: 1B, consulting; 3A, multiple academic centers; 5B, occasional legal cases; 8B, NIH R-01HO0592559: Center for Healthcare Research and Transformation; 9, president, International Rehab forum and Board of International Societies of PM&R

http://dx.doi.org/10.1016/j.pmrj.2012.04.010

REFERENCES

1. Haig AJ, Adewole A, Yamakawa KSJ, et al. The ligament flavum at L4−5: Relationship with anthropomorphic factors and clinical findings in older persons with and without spinal disorders. PM R 2012;4:23-29.
2. Haig AJ, Tong HC, Yamakawa KS, et al. Predictors of pain and function in persons with spinal stenosis, low back pain, and no back pain. Spine 2006;31:2950-2957.
3. Haig AJ, Theisen M, Geisser ME, Michel B, Yamakawa K. Team decision making for spine team assessment: Standardizing the multidisciplinary assessment for chronic back pain. Arch Phys Med Rehabil 2000;81:1281.
4. Haig AJ, Tomkins C. Diagnosis and treatment of lumbar spinal stenosis. JAMA 2010;303:71-72.
5. Barry MJ. Edgman-Levitan S. Shared decision making—the pinnacle of patient-centered care. N Engl J Med 2012;366:777-779.
6. Cottingham AH, Suchman AL. Litzelman DK. Enhancing the informal curriculum of a medical school: A case study in organizational culture change. J Gen Intern Med 2008;23:715-722.
7. Reuben DB, Tinetti ME. Goal-oriented patient care—an alternative health outcomes paradigm. N Engl J Med 2012;366:777-779.

The Complexities Surrounding Decisions Related to Prosthetic Fitting in Elderly Dysvascular Amputees

To the Editor,

The Point/Counterpoint article in the January 2012 issue of *PM&R* addressed the challenging decision of whether to fit an elderly dysvascular patient with transfemoral (TF) amputation with a prosthetic limb [1]. We would like to express our appreciation to *PM&R* for publishing this work, to Drs Frieden and Brar for providing a conceptual framework to assist in the formulation of this decision, and to Dr Esquanazi for providing a stimulating counterpoint to this discussion. It is clear that there are no simple decision algorithms to guide clinical decision making, and the available scientific evidence is inadequate.

Our goal in submitting this letter is to provide an additional perspective, supplemented by more recent literature, which will, it is hoped, augment the discussion and assist readers as they address this critical issue.

METABOLIC COST AND ENDURANCE

The metabolic consequences of ambulation with a prosthetic limb and their implications for fitting a TF prosthetic limb in patients with underlying cardiovascular disease are confusing, and clinicians tend to use various metabolic terms with inadequate precision. The rate of metabolic energy expenditure (mL O_2/kg/min) is the rate at which oxygen is consumed during a given exercise task and is reflective of the instantaneous cardiac demand (heart rate, stroke volume, and blood pressure). Therefore, it may be related to symptoms of angina or silent cardiac ischemia when exercise occurs at an intensity in which the oxygen demand of the myocardium exceeds the oxygen supply. In both amputees and nonamputees, the rate of metabolic energy expenditure increases with walking speed and is greater in amputees at any given walking speed. However, amputees choose a self-selected walking speed that is slower than nonamputees. The implications of this are that, if individuals with amputation are allowed to walk at their self-selected speed, then their rate of metabolic energy expenditure is the same as normal and there is no additional cardiac demand. It, therefore, should play little role in the decision to fit or not to fit a prosthetic limb.

The metabolic cost of ambulation (mL O_2/kg/m) in contrast, is the amount of oxygen consumed per distance walked and is reflective of the efficiency and economy of ambulation. It is increased in amputees compared with nonamputees at all walking speeds. From a clinical perspective, increased metabolic cost is reflective of increased muscle work to walk a given distance. Functionally, this may result in more limited endurance and reduced walking distances.