Orthopaedic PHYSICAL THERAPY PRACTICE

VOL. 26, NO. 1 2014

THE MAGAZINE OF THE ORTHOPAEDIC SECTION, APTA

40TH ANNIVERSARY
Celebrating 40 Years
Orthopaedic Physical Therapy 1974-2014

APTA
American Physical Therapy Association

Orthopaedic PHYSICAL THERAPY PRACTICE

In this issue

Regular features

VOL. 26, NO. 1 2014

OPTP Mission

To serve as an advocate and resource for the practice of Orthopaedic Physical Therapy by fostering quality patient/client care and promoting professional growth.

Publication Staff

Publication Title: *Orthopaedic Physical Therapy Practice* Statement of Frequency: Quarterly; January, April, July, and October
Authorized Organization's Name and Address: Orthopaedic Section, APTA, Inc., 2920 East Avenue South, Suite 200, La Crosse, WI 54601-7202

Orthopaedic Physical Therapy Practice (ISSN 1532-0871) is the official magazine of the Orthopaedic Section, APTA, Inc.

Nonmember subscriptions are available for $50 per year (4 issues). Opinions expressed by the authors are their own and do not necessarily reflect the views of the Orthopaedic Section. The Editor reserves the right to edit manuscripts as necessary for publication. All requests for change of address should be directed to the Orthopaedic Section office in La Crosse.

All advertisements that appear in or accompany *Orthopaedic Physical Therapy Practice* are accepted on the basis of conformation to ethical physical therapy standards, but acceptance does not imply endorsement by the Orthopaedic Section.

Orthopaedic Physical Therapy Practice is indexed by Cumulative Index to Nursing & Allied Health Literature (CINAHL) and EBSCO Publishing, Inc.

Officers

President:
Stephen McDavitt, PT, DPT, MS, FAAOMPT
Saco Bay Physical Therapy–Select Medical
55 Spring St Unit B
Scarborough, ME 04074-8926
207-396-5165
scfmpt@earthlink.net
Term: 2013-2016

Vice President:
Gerard Brennan, PT, PhD
Intermountain Healthcare
5848 South 300 East
Murray, UT 84107
gerard.brennan@imail.org
Term: 2011-2014

Treasurer:
Steven R. Clark, PT, MHS, OCS
23878 Scenic View Drive
Adel, IA 50003-8509
(515) 440-3439
(515) 440-3832 (Fax)
Clarkmfrpt@aol.com
Term: 2008-2015

Director 1:
Thomas G. McPoil, Jr, PT, PhD, FAPTA
6228 Secrest Lane
Arvada, CO 80403
(303) 964-5137 (Phone)
tommcpoil@gmail.com
Term: 2012-2015

Director 2:
Pamela A. Duffy, PT, PhD, OCS, CPC, RP
28135 J Avenue
Adel, IA 50003-4506
515-271-7811
Pam.Duffy@dmu.edu
Term: 2013-2016

Office Personnel

(608) 788-3982 or (800) 444-3982

Terri DeFlorian, Executive Director
x2040..... tdeflorian@orthopt.org
Tara Fredrickson, Executive Associate
x2030..... tfred@orthopt.org
Sharon Klinski, Managing Editor
x2020..... sklinski@orthopt.org
Carol Denison, ISC Processor/Receptionist
x2150.....denison@orthopt.org

Chairs

MEMBERSHIP
Chair:
Renata Salvatori, PT, DPT, OCS, FAAOMPT
889 1 Belle Rive Blvd
Jacksonville, FL 32256-1628
904-854-2090
Nata.salvatori@gmail.com
Term: 2013-2016

Members: *Derek Charles, Maureen Watkins, Matthew Lee, Michelle Strauss, Megan Poll, Cuong Pho, John Heick, Thomas Fliss, Scot Morrison*

EDUCATION PROGRAM
Chair:
Teresa Vaughn, PT, DPT, OCS, COMT
395 Morton Farm Lane
Athens, GA 30605-5074
706-742-0082
bhvaughn@juno.com
Term: 2013-2016

Members: *Kevin Lawrence, Neena Sharma, Jacob Thorpe, Nancy Bloom, Emmanuel "Manny" Yung, Cuong Pho, John Heick*

INDEPENDENT STUDY COURSE & ORTHOPAEDIC PRACTICE
Editor:
Christopher Hughes, PT, PhD, OCS
School of Physical Therapy
Slippery Rock University
Slippery Rock, PA 16057
(724) 738-2757
chrisjhughes@consolidated.net

Managing Editor:
Sharon Klinski
(800) 444-3982, x2020
sklinski@orthopt.org

PUBLIC RELATIONS/MARKETING
Chair:
Eric Robertson, PT, DPT, OCS
5014 Field Crest Dr
North Augusta, SC 29841
(803) 257-0070
ekrdpt@gmail.com

Vice Chair:
Chad Garvey, PT, DPT, OCS, FAAOMPT

Members: *Tyler Schultz (student), Mark Shepherd, Kimberly Varnado*

RESEARCH
Chair:
Duane "Scott" Davis, PT, MS, EdD, OCS
412 Blackberry Ridge ,Drive
Morgantown, WV 26508-4869
304-293-0264
dsdavis@hsc.wvu.edu
Term: 2013-2016

Members: *Kristin Archer, Paul Mintken, Murry Maitland, Dan White, George Beneck, Ellen Shanley, Dan Rendeiro, Amee Seitz*

ORTHOPAEDIC SPECIALTY COUNCIL
Chair:
Tracy Brudvig, PT, DPT, PhD, OCS
22 Duane Street
Quincy, MA 02169
(617) 724-4844 (Phone)
tbrudvig@mghihp.edu
Term: 2010-2013

Members: *Marie Johanson, Daniel Poulsen, Stephanie Jones*

PRACTICE
Chair:
Joseph Donnelly, PT, DHS, OCS
3001 Mercer University Dr
Duvall Bldg 165
Atlanta, GA 30341
(678) 547-6220 (Phone)
(678) 547-6384 (Fax)
donnelly_jm@mercer.edu

Vice Chair:
Kathy Cieslek, PT, PhD, OCS, FAAOMPT

Members: *Derek Clewley, David Morrisette, Tim Richardson, Jason Tonley, Mary Fran Delaune, Michael Connors*

FINANCE
Chair:
Steven R. Clark, PT, MHS, OCS
(See Treasurer)

Members: *Jason Tonley, Kimberly Wellborn, Jennifer Gamboa*

AWARDS
Chair:
Gerard Brennan, PT, PhD
(See Vice President)

Members: *Jennifer Gamboa, Corey Snyder, Jacquelyn Ruen, Karen Kilman*

JOSPT
Editor-in-Chief:
Guy Simoneau, PT, PhD, ATC
Marquette University
P.O. Box 1881
Milwaukee, WI 53201-1881
(414) 288-3380 (Office)
(414) 288-5987 (Fax)
guy.simoneau@marquette.edu

Executive Director/Publisher:
Edith Holmes
edithholmes@jospt.org

NOMINATIONS
Chair:
Bill Egan, PT, DPT, OCS
813 Princeton Ave
Haddonfield, NJ 08033
(215) 707-7658 (Phone)
Egan_W@msn.com

Members: *Cathy Arnot, RobRoy Martin*

APTA BOARD LIAISON –
Nicole Stout, PT, MPT, CLT-LANA

2013 House of Delegates Representative –
Joe Donnelly, PT, DHS, OCS

ICF-based Guidelines Coordinator –
Joe Godges, PT, DPT, MA, OCS

ICF-based Guidelines Revision Coordinator –
Christine McDonough, PT, PhD

SPECIAL INTEREST GROUPS

OCCUPATIONAL HEALTH SIG
Lorena Pettet Payne, PT, MPA, OCS
FOOT AND ANKLE SIG
Clarke Brown, PT, DPT, OCS, ATC–President
PERFORMING ARTS SIG
Julie O'Connell, PT–President
PAIN MANAGEMENT SIG
John Garzione, PT, DPT–President
IMAGING SIG
Doug White, DPT, OCS, RMSK–President
ANIMAL REHABILITATION SIG
Kirk Peck, PT, PhD, CSCS, CCRT–President

EDUCATION INTEREST GROUPS
Knee – Open
Manual Therapy – Kathleen Geist, PT, DPT, OCS, COMT
PTA – Open
Primary Care – Michael Johnson, PT, PhD, OCS

Editor's Note

The Strength is in the Numbers!

Christopher Hughes, PT, PhD, OCS

In this issue, Irrgang and Gil present the results of a grassroots effort by the Section to develop a National Orthopaedic PT Outcomes Database for patients with neck pain. Although only a pilot investigation, it addresses a much needed initiative--data collection. Using large database sets to benchmark performance presents challenges and opportunities. I think the pilot study enlightens us on both fronts. The authors state the usefulness of the information will enhance clinical performance and the value of orthopaedic physical therapy. Obviously clinical performance evaluation is a tough goal to achieve without a reference point or a baseline. As most know, the power will be in the collection and analysis of numbers and measures that are reliable and valid. The methodology used in getting this project off the ground attempts to address both concerns.

Knowing a number is only good if you believe in the number! Our belief should not be based on positive outcomes but accurate outcomes. Like our patients, self-rated performance can at times be overinflated from actual performance. As therapists we can also perceive the therapy to be better than it is (confirmation bias). That is why we need projects like this. We need to be ready to "face the music." Are we as good as we think we are? Or are we overrating ourselves? Only through large data set analysis can we really answer this question for the collective whole.

In his address 39th Mary McMillan Lecture Dr Delitto[1] stated, "In order for us to improve our performance, we first need to have some idea of how we are performing." If you follow sports, you know that statistics are kept on just about every facet of the game and every player. Right or wrong, good or bad, the numbers are what they are. They are used to define standings, select league leaders, negotiate salary, and also to ultimately achieve hall of fame status. Numbers don't always tell the whole story but they do tell a story. In the same address, Dr Delitto emphasized that we only need to build bridges between education, research, and practice only if we have created trenches. He stresses the need for each entity to dialog productively in the planning stages to first acknowledge shortcomings then to begin a valid strategy to solve them. A very valid point, recognize the problem to solve the problem! The transition to DPT education now affords the new graduate with the tools to not only be a consumer of the literature but hopefully a participant in the data collection process as well. The emergence of "clinical scientists" will insure that we all do our part and become stakeholders in the challenges we face as a profession.

Probably one of the best advantages and service of an association is to coalesce and foster the data mining process. In 2010 the American Academy of Orthopaedic Surgeons (AAOS) announced their plans to implement a US Joint Registry.[2] Today, the initiative has formal agreements with 221 hospitals and counting. The database has compiled data on more than 30,000 total joint arthroplasty procedures.[3] For more details see their website at: http://teamwork.aaos.org/ajrr/.

The goals of the American Joint Replacement Registry (AJJR) hit upon a familiar theme. Their mission is to foster a national center for data collection and research on total hip and knee replacement. The goals are to improve patient safety and quality of care, enhance medical decision-making, reduce medical spending, and advance orthopaedic science. Organizations such as the Orthopaedic Section are great resources for spearheading these types of projects. Our members bring motivation and brainpower, and will ultimately allow for strength in numbers! The pilot study by Irrgang and Gil presents the pros and cons of their current effort. They admittedly cite a low pool of complete data (data was reduced to about 38 out of 128 PTs (30%) on 248 patients. Not overwhelming but it is a start. More importantly is their discussion on what needs to improve to move forward. As more of these projects get off the ground, I hope as a professional you will consider participating. Now is a great time for the profession to get into the game. The timing is right, the need is justified and the ability is within reach! It is time for all of us to do our part, one patient at a time.

REFERENCES

1. Delitto A. We are what we do. *Phys Ther*. 2008;88(10):1219-1227.
2. McKee J. U.S. joint registry gets underway. http://www.aaos.org/news/aaosnow/apr10/cover2.asp Accessed November 26, 2013.
3. Etkin CD, Hobson SE. American Joint Replacement Registry Continues to Grow Initiative has collected data on more than 30,000 total joint arthroplasty procedures. http://www.aaos.org/news/aaosnow/oct12/research2.asp Accessed on November 26, 2013.

ERRATUM

In the Volume 25 No 4 issue of *Orthopaedic Physical Therapy Practice* we published an article by Kelli A. Robinson, titled Tendinopathy and Application to Hamstring Strain Injuries.

On page 208 of that article, an error was found in a sentence that should have read,

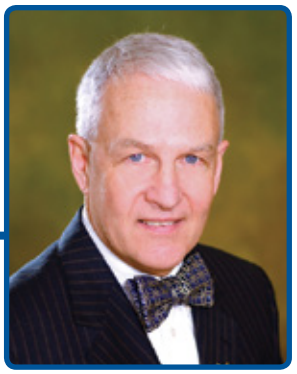
The semitendinosus arises from the ischial tuberosity by a conjoined tendon with the biceps femoris and curves around the medial condyle of the tibia and inserts into the medical surface of the tibia as part of the pes anserine complex.

The pdf of the article has been corrected and an updated version of the article has been uploaded to the orthopt.org web site. The editorial staff regrets the error.

President's Corner

Out with the Old and in with New

Stephen McDavitt, PT, DPT, MS, FAAOMPT



This last year the President's Corner Reports focused on informing our members about various impacts on practice to be considered during our fast moving transition through the process of health care transformation. We discussed the "paradox of autonomy," innovative practice models, defining practice value, and the new vision statement of the physical therapy profession and how the physical therapy profession will look to "transform society by optimizing movement to improve the human experience." As I pointed out in my last report, Ruth Purtilo, PT, PhD, FAPTA, would likely refer to as moving into our "societal identity phase" where the new vision will be guided by the principles of identity, quality, collaboration, value, innovation, consumer-centricity, access/equity, and advocacy.

From the information presented in those discussions on practice issues and impacts and that being currently disseminated throughout, if I were to summarize the challenges we need to focus on when we think of the "in with the new" part of "out with the old and in with the new," I suggest taking your pulse and respiration now and consider appreciating the following challenges for next year and beyond:

1. The current evolving framework of interdependent-multidisciplinary practice models will continue to create a corresponding challenge for physical therapist practice to be identified and appreciated for relative value while collaborating, integrating, and improving access to care.
2. Future models for alternative payment (likely 2015) will be defined by the *complexity* of the evaluation, *severity* of the patient's clinical presentation, and the *intensity* or the amount of therapy services required in managing or resolving the patient's condition. Those models will further challenge the economical and societal survival of the PT profession as physical therapists strive to more accurately and efficiently provide a diagnosis, a prognosis, effective interventions, and further measure effectiveness and value in patient/client management across complexities.
3. Acquiring and implementing the current evidence promoting accuracy, reliability, validity, and objective outcome measures in managing complex clinical challenges including pain and related behaviors will be in the best interest for physical therapist future outcomes.

In appreciating these views, the Orthopedic Section with member support and engagement will continue to proactively develop various approaches to advance evidence-based orthopaedic physical therapist practice including:

1. Supporting, producing, and promoting evidence-based orthopaedic physical therapist research.
2. Fostering health services research relevant to physical therapist practice.
3. Developing and providing orthopaedic physical therapist clinical practice guidelines.
4. Developing and providing a national orthopaedic physical therapy outcomes registry.
5. Supporting initiatives for innovations in practice that enhance orthopaedic physical therapists being identified as a value added solution in the transformation of health care and outcomes management.

As we move forward with these actions, it will require the membership to take a hard look at deeply embracing evidence and genuinely narrowing the practice models that currently widen variance and in turn outcomes in practice. I suggest we begin to review divergent models of care and determine how we are going to accept and promote best evidence in framing future practice models. We need to ask the hard questions about what should and should not be included in those models and accept how to narrow their gap. I look forward to the challenges of "in with the new," how about you?

Orthopaedic Section 40th Anniversary
2004 – 2014
A Time of Growth and Leadership

James Irrgang, PT, PhD, ATC, FAPTA; Terri DeFlorian, Executive Director

At the 2014 Combined Sections Meeting in Las Vegas, the Orthopaedic Section will celebrate its 40th anniversary. Over the last decade, guided by Strategic Plans that were established in 2004, 2007, and 2010 the Orthopaedic Section experienced substantial growth and demonstrated leadership for the profession. The current mission of the Orthopaedic Section is "To serve as an advocate and resource for practitioners of orthopaedic physical therapy by fostering patient/client care and promoting professional growth." The vision for the Section is "The Orthopaedic Section will be ***the*** source for the orthopaedic physical therapist." The strategic outcomes that have been established to achieve the mission and vision include Standards of Practice, Education/Professional Development, Public Identify and Promotion of Physical Therapy, Research, and Advocacy. Below I will highlight some of the major initiatives as they relate to the Strategic Plan that has been undertaken by the Orthopaedic Section over the last 10 years. But before I do that, I would like to first describe the growth of the Section over the last 10 years.

The growth and stature of the Orthopaedic Section are directly related to the leadership provided by the Section's Board of Directors and the strong and stable office staff (Table 1). Since 2003, membership in the Section has grown 33% from 14,372 members in 2003 to the current membership of 19,020. This includes 16,828 physical therapists and 633 physical therapist assistant members. During this same period of time, under the capable leadership of the Section's Treasurers, including Joe Godges, PT, DPT, MA, OCS, and Steve Clark, PT, MHS, OCS, the financial resources of the Section have experienced substantial growth. The Section's operating budget has grown from $1,152,927 in 2004 to the current operating budget of $1,941,473 and the Section's reserves have grown by 70% in the same time period. The strength of the Section's leadership and financial resources has enabled the Section to undertake and accomplish the initiatives described below.

STANDARDS OF PRACTICE

Clinical Practice Guidelines

The Orthopaedic Section has pioneered the way within the American Physical Therapy Association to develop and publish evidence-based clinical practice guidelines that are consistent with the World Health Organization International Classification of Functioning and Disability (ICF). The concept for the clinical practice guidelines arose at a "brainstorming session" of the Board of Directors at the 2005 Combined Sections Meeting in New Orleans. This brainstorming session was devised by Michael Cibulka to discuss ways in which the Section could make a substantial impact on orthopaedic physical therapy clinical practice. During this meeting, Joe Godges suggested that the Section should utilize the newly developed ICF model to create clinical practice guidelines for musculoskeletal conditions commonly managed by physical therapists.

One year later at the Combined Sections Meeting in San Diego, the Section convened a meeting with leaders in orthopaedic physical therapy to discuss the concept of the ICF-based clinical practice guidelines and to establish a model for the project. Individuals that participated in the one-day meeting included John Childs, PT, PhD, MBA, OCS (neck pain), Phil McClure, PT, PhD, FAPTA (shoulder), Joy MacDermid, PT, PhD (elbow/wrist), Anthony Delitto, PT, PhD, FAPTA (low back), Michael Cibulka, PT, DPT, MHS, FAPTA, OCS (hip), Lynn Snyder-Mackler, PT, ScD, FAPTA, SCS (knee), and Thomas McPoil, PT, PhD, FAPTA (foot/ankle). The meeting was chaired by Joe Godges, who gave an overview on clinical practice guidelines and James Irrgang, who gave an overview of the ICF model. Ken Harwood, PT, PhD, CIE, and Andrew Guiccione, PT, PhD, DPT, FAPTA, represented the APTA at the meeting.

At the conclusion of the meeting, it was decided that the Section would pursue the development of clinical practice guidelines for musculoskeletal conditions commonly treated by physical therapists. Furthermore, it was specified that the clinical practice guidelines would be based on the ICF model of functioning and disability. Work groups for each region of the body were established and funding was included in the Section budget for each work group to meet and accomplish its tasks.

The tasks for each work group were to identify the conditions commonly managed by physical therapists for each region of the body and to identify impairments in body structure and function, activity limitations, and participation restrictions that were associated with each condition. Furthermore, the work groups were to identify or develop a classification system that could be used to group patients into homogeneous subsets that would best respond to specific interventions. When possible, the classification system was to be linked to ICF levels of impairment of body structure or function. The next step was to describe the interventions and supporting evidence for specific subsets of patients based upon the classification system. Typically, it was expected that the interventions would focus on the impairments that define specific classifications. The focus was on interventions provided by physical therapists, however as appropriate, the guidelines could also include adjunctive procedures and/or pharmacological considerations.

Table 1. Orthopaedic Section Board of Directors and Office Staff from 2004 to 2014

Presidents
- Michael T. Cibulka, PT, DPT, MHS, OCS, FAPTA (2001 – 2007)
- James J. Irrgang, PT, PhD, ATC, FAPTA (2007 – 2013)
- Stephen McDavitt, PT, DPT, MS, FAAOMPT (2013 - present)

Vice Presidents
- Lola Rosenbaum, PT, DPT, MHS, OCS (2001-2004)
- Thomas G. McPoil Jr, PT, PhD, FAPTA (2004 – 2011)
- Gerard P. Brennan, PT, PhD (2011 - present)

Treasurers
- Joe Godges, PT, DPT, MA, OCS (2002 – 2008)
- Steven R. Clark, PT, MHS, OCS (2008 – 2015)

Directors
- Gary Smith, PT, PhD, OCS (2002 – 2005)
- James J. Irrgang, PT, PhD, ATC, FAPTA (2003 – 2007)
- William H. O'Grady, PT, DPT, OCS, FAAOMPT (2005 – 2013)
- Ellen R. Hamilton, PT, OCS (2007 – 2009)
- Kornelia Kulig, PT, PhD, FAPTA (2009 – 2012)
- Thomas G. McPoil Jr, PT, PhD, FAPTA (2012 - present)

Orthopaedic Section Office Staff
- Terri DeFlorian – Executive Director (1988 – present)
- Tara Fredrickson – Associate Executive Director (1993 – present)
- Sharon Klinski – Managing Editor Journals/Newsletters (1990 – present)
- Kathy Olson – Managing Editor ISCs (1998 – 2013)
- Carol Denison – ISC Processor/Receptionist (2005 – present)

In summarizing the evidence to support specific interventions, consideration was to be given to the strength of evidence with greater emphasis given to clinical research involving patients. If clinical evidence was lacking, evidence to support the biomechanical or biological plausibility of intervention was to be provided. Individual clinical research articles were graded (Level I to IV) according to criteria described by the Center for Evidence-based Medicine at Oxford, England. The overall strength of the evidence supporting the guidelines was graded according to guidelines described by Sackett as modified by Joy MacDermid and adopted by the Task Force for this project. In this modified system, the typical A, B, C, and D grades of evidence were modified to include the role of consensus expert opinion and basic science research to demonstrate biological or biomechanical plausibility.

Using these methods, under the leadership of Joe Godges, who has served as the ICF-based clinical practice guidelines coordinator, the Orthopaedic Section published its first clinical practice guideline on heel pain/plantar fasciitis, authored by Thomas McPoil et al Heel Pain—Plantar Fasciitis (*J Orthop Sports Phys Ther. 2008;38(4). doi:10.2519/jospt.2008.0302*) in the April 2008 issue of the *Journal of Orthopaedic and Sports Physical Therapy (JOSPT)*. Since then, the Section has published a total of 11 clinical practice guidelines in *JOSPT* (see Table 2) and the guidelines have also been placed on ClinicalGuidelines.gov (www.guidelines.gov). Currently, under the leadership of Christine McDonough, PT, PhD, the Section is developing a process for guideline revision. Additionally, the Section has shared the model for clinical guideline development with APTA and has provided training and collaborated with other Sections to assist them with the development of clinical practice guidelines.

National Orthopaedic Physical Therapy Outcomes Database

Another strategic objective for Standards of Practice was to develop a National Orthopaedic Physical Therapy Outcomes Database (NOPTOD). The purpose of the National Orthopaedic Physical Therapy Outcomes Database (NOPTOD) is to create a repository for clinical and process outcomes data for the most common conditions treated by orthopaedic physical therapists that can be used by clinicians to assess their clinical performance as well as to describe practice and the value of care provided by orthopaedic physical therapists.

To demonstrate feasibility of the NOPTOD, the Orthopaedic Section conducted a pilot project that was based on the Section's Neck Pain Clinical Practice Guidelines. Over a 6-month period, 38 physical therapists from 36 facilities submitted clinical outcomes and process of care information that summarized the care provided to approximately 250 patients. See the accompanying article in this issue of *OPTP* for a summary of the results of the Neck Pain Pilot Project.

The results of the Neck Pain Pilot Project demonstrate that collection of process and outcomes data summarizing the episode of care provided by physical therapists to individual patients is feasible. Future development of an electronic format for data collection will allow physical therapists to manually key in their data through a secure web-based platform. Additionally, if the data are already captured in an electronic medical record, methods to electronically migrate data from the medical record to the outcomes database will be explored. The process of outcomes data collection is only valuable to those that collected the data if summaries of the data are available in real time. This should include reports that summarize the process of care and outcomes for individual patients as well as for groups of patients (for example, all patients with neck pain within a specified date range) or subgroups of patients (for example, all patients in a specific classification such as neck pain with mobility impairments) and allow for comparison to their peers (ie, for benchmarking purposes).

Future development of the National Orthopaedic Physical Therapy Outcomes Database also includes plans for expansion to include collection of data for other regions of impairment including low back, shoulder, and knee. To ensure consistency, each component of the outcomes database will be based on ICF model of functioning and disability as well as applicable clinical practice guidelines published by the Orthopaedic Section.

The American Physical Therapy Association also has expressed interest in developing an outcomes registry. To avoid duplicative efforts and to take advantage of the expertise of the Section related to assessment of orthopaedic outcomes and the resources of the APTA, the Section will explore the possibility of working collaboratively with the APTA to more rapidly develop and expand the efforts to create the National Orthopaedic Physical Therapy Outcomes Database.

Ultimately, it is envisioned that the National Orthopaedic Physical Therapy Outcomes Database will provide physical therapists with a tool that will enable them to be reflective practitioners that are well

Table 2. Clinical Practice Guidelines Published by the Orthopaedic Section

• Ankle Stability and Movement Coordination Impairments: Ankle Ligament Sprains *J Orthop Sports Phys Ther.* 2013;43(9):A1-A40. doi:10.2519/jospt.2013.0305
• Shoulder Pain and Mobility Deficits: Adhesive Capsulitis *J Orthop Sports Phys Ther.* 2013;43(5):A1-A31. doi:10.2519/jospt.2013.0302
• Neck Pain *J Orthop Sports Phys Ther.* 2008;38(9):A1-A34. doi:10.2519/jospt.2008.0303
• Low Back Pain *J Orthop Sports Phys Ther.* 2012;42(4):A1-A57. doi:10.2519/jospt.2012.0301
• Hip Pain and Mobility Deficits – Hip Osteoarthritis *J Orthop Sports Phys Ther.* 2009;39(4):A1-A25. doi:10.2519/jospt.2009.0301
• Knee Pain and Mobility Impairments: Meniscal and Articular Cartilage Lesions *J Orthop Sports Phys Ther.* 2010;40(6):A1-A35. doi:10.2519/jospt.2010.0304
• Knee Stability and Movement Coordination Impairments: Knee Ligament Sprain *J Orthop Sports Phys Ther.* 2010;40(4):A1-A37. doi:10.2519/jospt.2010.0303
• Achilles Pain, Stiffness, and Muscle Power Deficits: Achilles Tendinitis *J Orthop Sports Phys Ther.* 2010;40(9):A1-A26. doi:10.2519/jospt.2010.0305
• Heel Pain—Plantar Fasciitis *J Orthop Sports Phys Ther.* 2008;38(4). doi:10.2519/jospt.2008.0302

poised for practice in today's challenging healthcare system and into the future.

EDUCATION AND PROFESSIONAL DEVELOPMENT

The Section has continued the long-held tradition of providing excellence in evidence-based educational opportunities for orthopaedic physical therapists.

Independent Study Courses

An important source of non-dues revenue for the Section is the Independent Study Courses (ISC) that have been published by the Orthopaedic Section since 1991. Under the leadership of Chris Hughes, who has served as the ISC Coordinator since 2006, the Section has published 32 ISCs that consist of 3, 6, or 12 monographs. By far, the most popular ISC in the series is Current Concepts of Orthopaedic Physical Therapy, 3rd ed, which was published in 2011. The Current Concepts ISC consists of 12 monographs and is an important resource for physical therapists preparing for the Orthopaedic Certified Specialist Examination. Since 2003, more than 5,500 copies of Current Concepts ISC have been sold. Other popular ISCs published by the Orthopaedic Section over the past 10 years include Update on Anterior Cruciate Ligament Injuries, Joint Arthroplasty: Advances in Surgical Management & Rehabilitation, and Orthopaedic Management of the Runner, Cyclist, & Swimmer. Future efforts to enhance the ICSs will include the use of technology to include electronic delivery methods and integration of multimedia to enhance learning. To ensure that the Section continues to offer ISCs that meet the needs of its members, the Section has established an ISC Advisory Board.

Combined Sections Meeting

Since 2003, the Combined Sections Meeting (CSM) has seen exponential growth in attendance and programing. Attendance at the 2003 Combined Sections Meeting in Tampa, FL, was 4,130 and in 2013, attendance at CSM in San Diego, CA was 9,218. A large portion of the growth and success of CSM can be attributed to the Orthopaedic Section. Under the leadership of Ellen Hamilton and Beth Jones, who served as the Section's Program Chairs for CSM, the Section expanded its educational programming at CSM. This includes Preconference Courses that offer attendees a 1 or 2 day concentrated course on a variety of topics. Many of the Preconference Courses include laboratory sessions that offer attendees the opportunity to develop and enhance their orthopaedic manual therapy psychomotor skills.

Over the past 10 years, approximately 20% to 23% of the attendees at CSM are Orthopaedic Section members. To meet the educational needs of those attending CSM, the Section has increased its number and variety of educational offerings. As a testimony of the interest in the Orthopaedic Section programming at CSM, attendance of the Section's offerings often exceeded room capacity.

After the Combined Section Meeting in New Orleans in 2010 the Orthopaedic Section led the call for a comprehensive review of CSM to identify opportunities for improvement in the oversight and management of CSM to allow for continued growth of the meeting while still meeting the educational and networking needs of the attendees. This initiative has led to the development of the CSM Steering Group and the development of Strategic Mission, Vision and Goals that will guide CSM going forward.

Annual Orthopaedic Section Meeting

While CSM is a successful educational opportunity for physical therapists, physical therapist assistants, and students, the Section leadership felt that there was an opportunity to provide an advanced educational offering for its members. As a result of this, the Orthopaedic Section held its first Annual Meeting, which was dedicated to advanced orthopaedic practice for physical therapists, in Orlando FL, May 2 to 4, 2013. The purpose of the meeting was to provide a hands-on advanced continuing education event that included lectures and breakout workshops related to physical therapist examination and treatment of the lumbosacral spine and lower extremity. The meeting was attended by approximately 200 physical therapists and included didactic lectures and break-out laboratory sessions that provided attendees with the opportunity to develop and improve orthopaedic manual physical therapy skills. Given the positive learning experience of the attendees, the second Annual Orthopaedic Section Meeting, entitled "The Triangle of Treatment: Integrating Movement System Impairments, Manual Therapy and the Biopsychosocial Approach in the Treatment of the Upper Quarter is planned for May 15 to 17, 2014 in St Louis MO.

Orthopaedic Residency Education

Over the last 10 years, there has been an increased interest in residency education. A clinical residency is a postprofessional planned learning experience in a focused area of clinical practice that is designed to significantly advance the physical therapist's knowledge, skills, and attributes. It combines opportunities for ongoing clinical mentoring with the theoretical basis for advanced practice and scientific inquiry based on a Description of Specialty Practice and is an important pathway to specialist certification.

The Orthopaedic Section has a long history of supporting the development of

orthopaedic residencies. Over the last 10 years, led by the efforts of Tara Jo Manal, PT, DPT, OCS, SCS, and Jason Tonley, PT, DPT, OCS, the Section has offered programming at the Combined Sections Meeting to provide information to help individuals develop an orthopaedic physical therapy residency. To facilitate development of an application for credentialing of an orthopaedic residency, the Section developed templates for components of the credentialing application that could be used by developing programs to prepare their application. The Section also developed a model curriculum that integrated use of select Independent Study Courses to supplement a program's didactic component and developed viable alternative financial models for residencies in academic and non-academic settings. For programs that have limited financial resources, the Section has provided financial grants that pay for the credentialing application fees. As a measure of the impact that the Section's support has had on orthopaedic residencies, there were a total of 8 orthopaedic residencies in 2003 and today there are more than 70 orthopaedic residencies.

Special Interest Groups

The Orthopaedic Section supports subspecialty practice through its Special Interest Groups (SIGs) that any Orthopaedic Section may join at no additional costs to the member. In large part due to the efforts of Thomas McPoil, the purpose and structure of SIGs were revised in 2008. Based on those revised rules of order and practices for SIGs, the purposes of a SIG are to: (1) provide educational programming; (2) serve as an educational and practice resource; (3) develop and recommend practice standards and terminology; (4) identify changes in legislative, regulatory and reimbursement issues at the state and national levels; (5) share practice information and address areas of concern related to the SIG domain; and (6) to foster credible research.

Special Interest Groups supported by the Orthopaedic Section include the Occupational Health, Foot and Ankle, Pain Management, Performing Arts, and Animal Rehabilitation SIGs. In 2011, the Orthopaedic Section Board of Directors approved the creation of the Imaging SIG to become a resource for Section members that are involved with imaging. The goals of the Imaging SIG are to promote the role of physical therapists in imaging, establish an evidence base for imaging by physical therapists, provide professional development and educational opportunities related to imaging, monitor and influence activities that may impact the use of imaging by physical therapists, develop imaging practice competencies, and to foster inclusion of imaging in entry-level physical therapist education programs.

RESEARCH

Orthopaedic Section Grants Program

Under the auspices of the Research Committee, which in the last 10 years was chaired by Kelley Fitzgerald, PT, PhD, OCS, FAPTA, Lori Michener, PT, PhD, ATC, SCS, and Duane Scott Davis, PT, MS, EdD, OCS, the Orthopaedic Section has provided substantial funding to support research conducted by Orthopaedic Section members. Through the Orthopaedic Section Grants Program, the Section supports new and established investigators. Currently, the Section awards 3 grants of up to $15,000 for new investigators who have not previously received federal or national-level competitive research support and one unrestricted grant up to $25,000 that is open to new and established investigators. Guided by the Orthopaedic Section Research Agenda that was established in 2009, research supported by the Orthopaedic Section small grants program must address one of the following areas: (1) examine the effectiveness of a treatment approach on a well-defined sample of patients with orthopaedic problems; (2) examine patient classification procedures for the purposes of determining an appropriate treatment; (3) further establish the meaningfulness of an examination procedure; (4) examine the role of the orthopaedic physical therapist in the health care environment; or (5) mechanistic studies that have a clear and direct impact on evaluation and/or treatment techniques used in orthopaedic physical therapy practice. A list of projects recently funded through the Orthopaedic Sections Grants Program can be found at https://www.orthopt.org/content/c/previous_grant_recipients.

Clinical Research Network

A Strategic Objective in the 2010 – 2014 Orthopaedic Section Strategic Plan was to establish a Clinical Research Network (CRN) to support multi-center orthopaedic physical therapy research. The purpose of the CRN was to conduct meaningful clinically important research and to provide an opportunity for more Section members to be engaged in clinical research. The intent of this initiative was to provide any Section member who is interested in research, but does not have the resources to independently conduct a research project, with the opportunity to participate in and contribute to important clinical research to advance the practice of orthopaedic physical therapy. The involvement of multiple clinicians and practices in the CRN enables projects to be completed efficiently and enhances the generalizability of the results to practicing clinicians.

In 2012, Orthopaedic Section awarded a $300,000 three-year grant to establish a Clinical Research Network to Dr. Steven George from the University of Florida to create the Orthopaedic Physical Therapy – Investigative Network (OPT-IN) that will conduct a multi-center study entitled, Optimal Screening for Prediction of Referral and Outcome (OSPRO) Cohort Study. This Clinical Research Network provides Section members from across the country with an opportunity to participate in an important and highly relevant clinical research study and will establish a network that can support additional future research. The purpose of the OSPRO Cohort Study is to develop and validate national screening tools for red and yellow flags for use by physical therapists in orthopaedic practice settings. The results of this study will enhance existing patient classification procedures for commonly treated regions of impairment.

Support for the Foundation for Physical Therapy

The Orthopaedic Section has a long-standing history of providing financial support to the Foundation for Physical Therapy. The Orthopaedic Section has provided gifts to the Foundation for 14 consecutive years that has totaled almost $1 million. In 2001, the Section made a 5-year pledge of $250,000 to support a Clinical Research Network and this pledge was fulfilled in 2006. In 2007, the Section made a $500,000 seven year pledge to establish an endowed Orthopaedic Physical Therapy Research Fund as part of the Foundation's Destination for Research Excellence Major Gifts Campaign. This pledge will be fulfilled in 2014 and will provide a $40,000 grant every 3 years to support orthopaedic physical therapy research. In recognition for the Section's strong and ongoing support of the Foundation for Physical Therapy, the Section received the Foundation's *Premier Partner in Research Award* in 2011.

Most recently, the Section provided a 2-year pledge of $25,000 to support

the Foundation's initiative for a Referral for Profit Study and a 5-year pledge of $150,000 to establish a Center for Excellence in Health Policy Research. The Section's continuous and ongoing support of the Foundation has funded research that is important to orthopaedic physical therapy practice.

ADVOCACY

The Orthopaedic Section continues to be a strong advocate of orthopaedic physical therapy practice and has collaborated with the American Physical Therapy Association, APTA Chapters, and the American Academy of Orthopaedic Manual Physical Therapists on a number of important practice issues. The Orthopaedic Section has actively promoted and defended the practice of thrust (manipulation) and non-thrust joint mobilization by physical therapists and addressed issues related to referral for profit.

To support advocacy efforts, in 2010 the Section began to award up to three $5,000 advocacy grants per year to Chapters to support advocacy and legislative efforts that are important to the practice of orthopaedic physical therapy. To date, a total of 4 advocacy grants have been awarded to address issues related to defense of anti-referral for profit arrangement legislation and legislative efforts to remove restrictions for physical therapists from performing spinal manipulation. In 2009, the Section co-sponsored a Capitol Hill Day with the American Academy of Orthopaedic Manual Physical Therapy, in which almost 200 physical therapists met with members of Congress to advocate for issues important to the practice of orthopaedic physical therapy.

AWARDS PROGRAM

The Orthopaedic Section has a robust awards program that includes the Paris Distinguished Service Award, James A. Gould Excellence in Teaching Orthopaedic Physical Therapy Award, Rose Excellence in Research Award, Outstanding Physical Therapy Student Award and Outstanding Physical Therapist Assistant Student Award. In 2007, the Section established the Richard W. Bowling and Richard E. Erhard Orthopaedic Clinical Practice Award to acknowledge an individual who has made an outstanding and lasting contribution to the clinical practice of orthopaedic physical therapy as exemplified by the professional careers of Richard W, Bowling and Rich-

Table 3. Orthopaedic Section Award Recipients from 2003 to 2013

Paris Distinguished Service Award	
2013	Michael T. Cibulka, PT, DPT, MHS, OCS, FAPTA
2012	Thomas G. McPoil, Jr, PT, PhD, FAPTA
2011	No Award Given
2010	Daniel Riddle, PT, PhD, FAPTA
2009	Jan Richardson, PT, PhD, OCS, FAPTA
2008	Stephen McDavitt, PT, DPT, MS, FAAOMPT
2007	Z. Annette Iglarsh, PT, PhD, MBA
2006	No Award Given
2005	Lola Rosenbaum, PT, DPT, MHS, OCS
2004	William Boissonnault, PT, DHSc, FAAOMPT
2003	Carol Jo Tichenor, PT, MA, AAOMPT
James A. Gould Excellence in Teaching Orthopaedic Physical Therapy Award	
2013	Mark Bishop, PT, PhD
2012	Tim Noteboom, PT, PhD, SCS
2011	Eric J. Hegedus, DPT, MHSc, OCS
2010	Ron Andrews, PT, PhD
2009	Robert Landel, PT, DPT, OCS, FCFMT
2008	Terese L. Chmielewski, PT, PhD, SCS
2007	Gregory S. Ford, PT, DPT, MS, OCS
2006	Tara Jo Manal, PT, DPT, OCS, SCS
2005	Patricia King, PT, PhD, MTC, OCS
2004	Donald Neumann, PT, PhD, FAPTA
2003	Elaine R. Rosen, PT, DHSc, FAAOMPT, OCS
Rose Excellence in Research Award	
2013	Emilio J. Puentedura, PT, DPT, PhD
2012	John Willson, PT, PhD
2011	Joseph Zeni, Jr, PT, PhD
2010	Michael "Mike" J. Walker, PT, DSc, OCS, FAAOMPT
2009	Wendy J. Hurd, PT, PhD, SCS
2008	Bohdanna T. Zazulak, DPT, MS, OCS
2007	Gerard P. Brennan, PT, PhD
2006	John D. Childs, PT, PhD, MBA, OCS, FAAOMPT
2005	Paula M. Ludewig, PT, PhD
2004	Timothy Flynn, PT, PhD, OCS
2003	Julie M. Fritz, PT, PhD, ATC
Richard W. Bowling – Richard E. Erhard Orthopaedic Clinical Practice Award	
2013	No Award Given
2012	Timothy Flynn, PT, PhD, OCS, FAAOMPT
2011	Catherine E. Patla, PT, DHSc, MMSc, OCS, MTC, FAAOMPT
2010	Anthony Delitto, PT, PhD, FAPTA
2009	Shirley Sahrmann, PT, PhD, FAPTA
2008	Michael T. Cibulka, PT, DPT, MHS, OCS, FAPTA
2007	Richard W. Bowling, PT, MS, & Richard E. Erhard, PT, DC
Outstanding Physical Therapy Student Award	
2013	Eric Lehman, University of Pittsburgh
2012	Sara Harvey, West Virginia University
2011	Stephanie Lynch, Virginia Commonwealth University
2010	Brooke R. Winder, University of Southern California
2009	Renata Salvatori, Virginia Commonwealth University
2008	No Award Given
2007	Michelle Kiney, Washington University and Robin Beauregard, University of Southern California
2006	Kimiko Yamada, University of Southern California
2005	Jonathan Sum, University of Southern California
2004	John Popovich, University of Southern California
2003	Shane Jonathan Bronson, Shenandoah University
Outstanding Physical Therapist Assistant Award	
2013	Bethany Smahaj, Somerset Community College
2012	Donald Glenn Trail, Somerset Community College
2011	Natalie Chris Garland, Somerset Community College
2010	Valerie A. Cooper, Somerset Community College
2009	Barry P. Buchignani, Somerset Community College
2008	Isaac R. Mills. Somerset Community College
2007	No Award Given
2006	No Award Given
2005	No Award Given
2004	No Award Given
2003	No Award Given

ard E. Erhard. A list of Orthopaedic Section Awardees from 2003 through 2013 is summarized in Table 3.

SUMMARY

Over the last 10 years, guided by its Strategic Plans, the Orthopaedic Section has experienced substantial growth and demonstrated leadership for the profession. The accomplishments of the Section over the last 10 years could not have been made without the wise leadership of previous Section Boards as well as the countless volunteers who contributed to Section initiatives. Future growth of the Section will depend on continued involvement of hard-working dedicated volunteers as well as strong support provided by the Orthopaedic Section office staff. Financially, the Section's reserves will ensure that there are sufficient financial resources to allow it to continue to meet and exceed the expectations of the Section's members.

Going forward into the fifth decade, the Orthopaedic Section is well positioned to continue its leadership and support for the many important issues that affect the profession and practice of orthopaedic physical therapy in the evolving health care environment.

Continuity of Care Applied to a Patient with Staged Bilateral Knee Replacements

Christina D. Gurney, DPT

Inland Hospital, Waterville, ME

ABSTRACT

Background and Purpose: Continuity of care contributes to greater patient satisfaction. The following case is an example of how the physical therapist/physical therapist assistant (PT/PTA) team is able to work together to provide continuity to a patient over a series of care episodes. **Case Description:** The patient is a 62-year-old female who underwent bilateral total knee replacements. She participated in several courses of physical therapy in both outpatient and inpatient settings with the same PT/PTA team. **Outcomes:** The PT/PTA team maintained continuity of her care throughout 41 out of 44 visits, which occurred over 5 separate episodes of care in 10 months. Co-treatment, PT supervisory strategies, and directed care were used during each episode as well as written and oral hand-off communication to assure continuity of care. The patient outcomes from each total knee arthroplasty were met within published standards, as well as a complicating incident from a co-morbid condition. **Clinical Relevance:** Continuity of care aids in the development of trust that is essential for patients to be engaged in a treatment plan. Patients who see the same rehabilitation personnel during a succession of visits are more likely to report a high level of satisfaction with the care than those who see more than one provider. **Conclusion:** Continuity of care using a team of clinicians may be an approach for physical therapy in order to improve patient outcomes and satisfaction.

Key Words: longitudinal care, physical therapy, total knee arthroplasty

INTRODUCTION

Patients seen by the same clinician or team of clinicians over the course of illness have a greater satisfaction level and outcome with their care.[1] Continuity of care as an element of physical therapy practice is beneficial to patients; however, during the current environment of health care transformation, continuity of care is a challenge in many practice settings. Scheduling of patients to improve provider productivity can result in the patient seeing several clinicians during any one episode of care. This case discusses one small, rural setting that promotes continuity of care over various physical therapy settings through the use of physical therapist/physical therapist assistant (PT/PTA) teams. The author (CG) relates her experience in this setting using a PT/PTA team concept to assure quality care. The PT/PTA team discussed in this case has worked together for 6 years, with additional staff assisting to provide 7-day coverage in acute care.

Continuity of care aids the development of trust that is essential in order to have patients engaged in the treatment plan. "The relationship between patient and therapist traditionally has been viewed as an important determinant of treatment outcome and is considered central to the therapeutic process. This concept has been termed *therapeutic alliance*."[2] There are 3 main components to the therapeutic alliance: (1) the therapist-patient agreement on goals of treatment, (2) the therapist-patient agreement on interventions, and (3) the bond that develops between therapist and patient.

It has not been determined which factors result in alliance but providing positive feedback, addressing the patient's questions, and providing understandable instructions for exercise are positively related with therapeutic alliance.[2] The third component addresses the bond that develops between the patient and the therapist which is fostered by the familiarity that is gained through continuity of care. "Continuity of care refers to the degree to which a series of heath care events are experienced as coherent and connected across time and setting."[3] A study of adults who attended outpatient physical therapy found that patients who saw the same therapist during a succession of visits were more likely to report complete satisfaction than those who saw more than one therapist. It is not clear from prior research if there is a positive impact on outcome other than patient satisfaction.[3]

The therapeutic alliance concept is easily applied to individual provider-patient interactions. When multiple care providers and multiple care settings are involved in the patient care, it is essential that skilled communication and true collaboration exist to provide patient-centered care.[4] True collaboration rather than a supervisory relationship is necessary to provide efficient patient-centered care in a PT/PTA team.

Being viewed as the patient's therapy team is essential for the PT/PTA team to gain the patient's trust with this model of care. All members of the therapeutic team should be introduced to the patients early in their care to demonstrate to the patient the team intention to honor the patient-centered goals. To make the team interaction more evident to the patient, each individual provider attempts to speak with the patient while in the clinic. Sometimes both PT and PTA are scheduled to work with the patient during the visit and other times it is as simple as the nontreating team member stopping during the treatment to say hello and ask how things are going.

Skilled communication throughout each episode of care may be planned or occur spontaneously as patient-needs require. When functioning as a PT/PTA team, flexibility must be present in the schedule of both providers. At times, treatment techniques and exercise instructions may differ due to personal style, and patients are accepting if the potential of differences are explained prior to the treatment. All team members must assure that all communication is clear both to the patient and between each other. Established teams may naturally use a set communication style and content to assure appropriate information is relayed to the other during transitions in care. In other cases, a more formal hand-off report guide may be used to assure essential information is not forgotten.[5]

CASE DESCRIPTION

The patient is a 62-year-old female retired health care worker. She has long-standing bilateral knee osteoarthritis with progressive decrease in functional mobility due to pain. Her medical history is significant for active co-morbidities including hypertension, obesity, hypothyroidism, polymyalgia rheumatica, and gastro-esophageal reflux disease. Her past surgical history includes bilateral lower extremity venous stripping,

hysterectomy, multiple right knee arthroscopies, unknown right shoulder procedure 25 years ago, right trigger finger release, carpal tunnel release, and bilateral thumb fusions. Her current medications include Synthroid 125 mcg, Celebrex 200 mg, Norvasc 10 mg, Prednisone 5 mg, Lasix, 20 mg, Cymbalta 60 mg, Prevacid 30 mg, Percocet 7.5-325 mg, Vitamin D, and a multivitamin.

She is married, a nonsmoker, and drinks alcohol rarely. She is an active volunteer within the community and does much of the outdoor work at her home. Due to pain in her knees, she had noticed a decline in her activities such as difficulty tending to the gardens, maintaining the lawn, going up and down stairs, and walking longer distances.

The patient was seen for 5 episodes of care over 10 months. Delivery of care was administered through the following time periods.

1. Outpatient left knee arthroscopy (Month 1)
2. Acute care right total knee replacement (Month 2)
3. Outpatient right total knee replacement (Months 2 & 3)
4. Acute care left total knee replacement (Month 8)
5. Outpatient left total knee replacement (Month 8-10)

Physical therapy services were initiated in Month 1 due to degenerative joint disease in both knees. A left knee procedure for a meniscus tear had been performed 90 days prior to the initial physical therapy. A right total knee arthroplasty (TKA) was scheduled; however prior to the surgery, the patient sustained a fall injuring her left knee. Referral was made to physical therapy for treatment of the left knee to improve ability to bear weight on the left lower extremity in preparation for the right TKA postoperative period. At the time of the initial physical therapy, the patient reported decreased function of the left knee and her right knee had become symptomatic with pain on activities. Radiographic examination of the right knee showed a varus collapse of the right knee with near bone on bone contact, resulting in the diagnosis of end stage osteoarthritis. During the initial evaluation, the PT/PTA model of care was explained to the patient and the PTA was introduced to the patient. During this course of outpatient treatment (6 visits), the physical therapist was the primary clinician for the patient, but the PTA was introduced and assisted with treatment occasionally interacted with the patient throughout and administered a full treatment to the patient on her sixth visit. Half-way through the first episode of care, the patient was rescheduled for right TKA surgery. At discharge from this episode of care, the patient indicated that she was pleased with the care and was satisfied that the PT/PTA team would follow her both in the hospital and in outpatient physical therapy following her surgery.

The patient underwent the right TKA and was seen by PT/PTA on the day of surgery for fitting of a continuous passive motion (CPM) machine. Physical therapy evaluation followed postoperative (PO) day 1 with both the PT and the PTA collaborating to complete the process. Standard post-op TKA goals for bed mobility, sit to stand transfers, ambulation, and stair climbing were established to prepare the patient for discharge home. The patient was seen for 5 treatment sessions with discharge on PO day 3 after meeting her functional goals. During this second episode of care, 3 of her sessions were with the same PT/PTA team who were most familiar with her and two of her sessions were completed by another physical therapist for weekend care. Weekend acute care is provided by PT staff on a rotational basis. Written and verbal hand-off communication with the covering weekend PT helps to minimize the effects of having another clinician involved.[5] The patient was discharged home with a referral for home care physical therapy services from an outside vendor since this hospital does not provide home care services. She received two home care physical therapy visits before she transitioned to outpatient physical therapy.

Episode 3 for outpatient physical therapy was initiated on PO day 13 for the right TKA. The patient presented as would be expected post TKA with range of motion (ROM) limitations and weakness in the involved extremity. During this episode, the patient was seen for 11 visits, 7 with the PT and 4 with the PTA. Communication for transitioning care was completed verbally the day of treatment and also by documentation in the patient's chart. A flow sheet of exercises with repetitions performed was included in the documentation. One critical incident was recorded during this episode of care when the patient tripped and fell prior to an appointment. The PTA was the scheduled provider for the appointment and upon learning of the fall, the PTA interrupted the PT who was with another patient, and she privately explained the situation. The PT determined the patient needed to be seen by the PT and requested the PTA to step in to care for patient that the PT was working with so that the physical therapist could attend to the changing status of the patient. When something out of the ordinary transpires during patient care, it is the role of the PTA to notify the primary PT of the event. In this instance it was possible for the PTA and PT to "trade" patients so that the PT could determine if alterations to the plan of care was necessary due to the fall. When the PT and PTA work collaboratively, both are familiar with nearly all patients on the supervisory PT's caseload. This type of teamwork is seamless and ensures that even when there are unexpected occurrences, their patients experience continuity.

The patient was reassessed by the physical therapist and determined it was safe to proceed with the original treatment plan. Towards the end of this third episode of care, the patient indicated that her left knee was becoming more symptomatic with her exercises than her right knee. The outcomes from her right TKA were excellent for gaining pain free ROM, ambulation ability, and the patient reported a high level of satisfaction with her progress. She was discharged from outpatient physical therapy with the expectation that the patient would be seen again for a left TKA.

Five months following the right TKA, the patient underwent a left TKA. The PTA conducted a preoperative education session during which the patient expressed the desire to have the same PT/PTA team for her postoperative rehabilitation. She shared that she liked having the team for all her treatments because she knew what to expect and they helped her to achieve her goals quickly.

The patient was again fit for a CPM on the day of her surgery and received PT evaluation on PO day 1. The patient was seen for a total of 5 treatments while in the hospital, two each with the PT and PTA, and one with another PT. Since the patient was familiar with all of the clinicians, she was confident and relaxed throughout the hospitalization. Prior to discharge, the patient expressed the desire to avoid the delay in rehabilitation that occurred during the first TKA with use of a home care vendor. She also requested outpatient therapy be initiated sooner than two weeks post-op. The PT communicated the desire to the surgeon along with the recommendation that the patient initiate outpatient physical therapy directly upon discharge from the hospital. A plan was made for direct transition to outpatient physical therapy services the same week. No delay in scheduling was antici-

pated since the PT/PTA team in this setting was able to follow the patient in both the inpatient and outpatient setting.

On PO day 3, the patient met her physical therapy goals and was discharged home to begin outpatient physical therapy on PO day 6.

The patient was scheduled for a one hour appointment. The first half hour was with the PT to complete her evaluation and during the second half hour the patient worked with the PTA to initiate her exercise program. The PT felt comfortable turning the patient directly over to the PTA on the very first day due to the comfort level and familiarity that the PT, PTA, and patient had with each other.

At the beginning of her outpatient rehabilitation, it was anticipated that the patient would require more than 11 treatments, the number that she had during her first TKA, because she bypassed having home care physical therapy. The patient progressed well in regards to gaining ROM, strength, and her functional mobility. By 5 weeks (12 visits) after surgery, the patient had met nearly all of her therapy goals and discussion of discharge was initiated. Discharge, however, was delayed because she had complaints of increased joint pain, inability to sleep, and increased fatigue. After a few visits with the same symptoms, it was determined that her recovery process was taking a different path than anticipated. Discussion of some of the possibilities occurred and one of those was a possible flare up of her polymyalgia rheumatica. Polymyalgia rheumatica is an inflammatory disorder characterized by pain in the shoulders to the elbows, and pelvic girdle to the thighs. The pain is generally worse in the morning and at night, causing difficulty with sleeping.[6] The patient had not considered that as a possibility because she believed that her symptoms were simply from over exerting herself. She was referred to her primary care provider for an assessment of her symptoms. Her goals for therapy for the TKA had been accomplished; however, she was not doing as well functionally as she had done previously and the PT did not feel comfortable discharging her from services. She was scheduled to return to therapy in two weeks to assess her progress and determine if she was prepared for discharge at that time. When the patient returned two weeks later, she shared that she was treated with a higher dose of prednisone that had significantly improved her symptoms. Her energy level was improving and her joint discomfort was also improved. The patient was seen for 17 treatment sessions with the PT seeing her for 10 sessions, the PTA seeing her for 7 sessions. Although the 17 visits for this episode of care were greater than the 11 visits experienced during the first TKA admission, the longer length of stay was justified due to the immediate transition to outpatient PT from hospital discharge and the co-morbidity complications. Prior experience with the patient and continuity of care with this patient led this PT/PTA team to early identification of an inflammatory process that was preventing this patient from regaining her prior level of function. If this patient had seen several different clinicians, it is doubtful that the early identification would have occurred.

OUTCOMES

This patient was seen for 5 separate episodes of care over the course of 9 months with the same PT/PTA team for both her inpatient and outpatient rehabilitation. An important characteristic of continuity is the degree of consistency in the provider of care. Less continuity in PT services may compromise communication and trust between the patient and provider.[3] This patient was seen for a total of 44 treatments during all episodes of care. The PT/PTA team participated in the care for 41 out of the 44 visits. The 3 visits that were not carried out by either of these clinicians were weekend visits during the patient's hospitalization. These clinicians have created a professional relationship and working structure that enables them to work at a high level of productivity while maintaining continuity of care with their patients.

Clinicians who provide services across multiple settings in a hospital system need to be available to treat the fluctuating caseload of acute care patients throughout the normal work week. Therefore their schedule cannot be completely booked with consecutive outpatients on any week day. The outpatient appointment schedule for this PT/PTA team appears on the schedule computer screen as one column shared by the two clinicians. This type of scheduling of clinician teams ensures sufficient time to address inpatient care, day surgery patients, preoperative education sessions, and interdisciplinary team meetings that are not part of a typical outpatient schedule. When one clinician is working in acute care, the other may be in the outpatient department. Throughout the day they are in constant flux to meet the needs of the patients. The flexibility of this schedule allowed for the patient in this case study to be seen 100% of the time by the PT/PTA team during her outpatient rehabilitation and the majority of the time in the acute care setting (Table 1).

According to the *Guide to Physical Therapist Practice*, the expected range for number of visits per episode of care for this diagnosis is 12-60. Both outpatient episodes of care were near the lower end of the expected treatment sessions.[7] The right TKA had an outpatient length of stay of 11 visits over the course of 6 weeks. She started outpatient therapy 14 days after surgery. The left TKA had an outpatient length of stay of 17 visits over the course of 8 weeks. She started outpatient therapy 6 days after her surgery. It was expected that her course of outpatient treatment for her second TKA would have been shorter than 17 visits. The therapist anticipated that she would likely have a few more outpatient visits compared to her first TKA since she bypassed home care physical therapy and transitioned directly to outpatient PT services. The final few weeks of her physical therapy care were complicated by complaints of increased pain throughout her major muscles and joints and fatigue. She had a medical history of polymyalgia rheumatica that was believed to be impacting her level of function. At her 12th visit (5 weeks after surgery) with her second total knee replacement she had achieved 0° to 110° of left knee AROM. This was approximately two weeks earlier than when she achieved

Table 1. Percentage of Time the Patient was Seen by Each Clinician and the PT/PTA Team

	Outpatient Visits	Inpatient Visits	TOTALS
Total	34	10	44 visits
Primary PT visits	22	3	25 (57% of visits)
Primary PTA visits	12	4	16 (36% of visits)
Other PT/PTA	0	3	3 (7% of visits)
	100% of visits with PT/PTA team	93% of visits with PT/PTA team	

this same ROM with her first TKA. She was not discharged at that time because she experienced a setback with her functional mobility and activity tolerance due to co-morbidities. Since the therapist was familiar with this patient's typical course of recovery, the co-morbid inflammatory process that was impeding her progress was identified quickly. After she received treatment for her symptoms, her ability to function without fatigue and increased pain throughout her body improved and she was discharged from therapy.

DISCUSSION

It is challenging to provide quality, effective care to patients while also meeting productivity expectations. "There is an emphasis on productivity, cost containment, and evidence-based practice in today's health care system. The initiation of pay-for-performance has further emphasized the need for the outpatient PT manager to ensure efficient and effective care."[8] Use of a physical therapist assistant in physical therapy care is a valuable means to help meet financial targets yet deliver continuity of care. When the relationship between the Physical Therapist and Physical Therapist Assistant is built on trust, respect, and skilled communication, the patient will see that they are working jointly. Even though differences exist between the decision making process and skills of each professional, the patient should be confident that all team members will provide excellent care. There are many determinants to how the PT/PTA relationship is formulated. Some include duration of relationship and having similar professional goals. Just as a therapist having familiarity with a patient improves efficiency of care, team members being familiar with how each other works will also affect efficiency. When a PT and PTA have worked together for a period of time, they begin to anticipate each other's styles of treatment and working methods. Patients should see that there is a positive relationship between the clinicians who are working with them. It is important for clinicians to "manage-up" each other. Managing up is a term used by Quint Studer, a health care consultant, in which you portray others in a positive light, or positioning them to look good.[9] This helps the patient feel confident about the care they are receiving from a team of people.[9] The patient should not feel that they are getting substandard treatment when being seen by the PTA; however, the patient should realize the difference in the duties of a PT and PTA. It is beneficial for a patient to see and hear the team clinicians interacting and consulting regarding care decisions. Continuity of care is enhanced when the team members share information with the patient that was part of the PT/PTA collaboration. This skilled communication technique reinforces to the patient that information told to one member of the team is shared with the others. This gives the patient a sense of ease that all clinicians are communicating and working together.

Longitudinal continuity, similar to continuity of care, is a term that means that the patient is seen by the same practitioner for all care over an extended period of time. Longitudinal continuity may be linked to a high degree of patient satisfaction. Patients from the United Kingdom and the United States were studied and 80% of them stated that seeing the same physician over time was important to them, and those who did not see the same physician were less satisfied.[1] The clients seen by this PT/PTA team only see one of the two team members during each outpatient treatment. Inpatient care is provided 7 days a week. Good hand-off communication diminishes the effect of introducing a different clinician for weekend treatment. It is easier when there are fewer clinicians involved for the PT to monitor the progress of the patient, make adjustments to their plan, and remain involved in their care. In the study conducted by Beattie et al,[1] they described an internal and external subscale. The internal subscale reflected client satisfaction with the patient/therapist relationship. The external subscale reflected the client satisfaction with support staff and clinic environment. Complete satisfaction with care on the internal subscale was reported by 71.2% of the subjects who were treated by one provider. Only 28.8% of those who reported compete satisfaction were treated by more than one therapy provider. On the external subscale, 66.8% of the clients had one provider and reported complete satisfaction and 33.2% who had had more than one provider. These findings indicate that continuity with the same clinician may be an approach for outpatient therapy scheduling when addressing patient satisfaction. There are several reasons that rehabilitation clinics may not adhere to this type of scheduling such as the need to fill in for a vacationing or ill therapist, and some clinics schedule patients with the first available clinician as the emphasis may be placed on keeping full schedules and maximizing productivity.[1]

Physical therapy assistants are an integral part of some rehabilitation teams; however, introducing an assistant to the client/therapist relationship can be viewed by the patient as abandonment especially if there are several clinicians that get involved in their care. The method that these clinicians used to address continuity of care seems to be a realistic model with the ability to use a physical therapy assistant while keeping the physical therapist active in the care of their patients. This model also allows for a high level of flexibility. The patient appreciates the consistency, providing the expectations are set early in the patient's care. If they are not told that there will be an assistant working with them or are not introduced early in their episode of care, they will likely have feelings of abandonment and may become dissatisfied.

When there are several physical therapy clinicians involved in a single patient's care, there is a high risk that coordination of care and communication will be deficient. "Poor care coordination may result in conflicting information to patients and caregivers and lead to a loss of confidence in providers. It may also produce confused under informed or noncompliant patients, a particularly troublesome outcome when successful recovery depends upon patient cooperation. Coordination failures may produce patient dissatisfaction that may have negative consequences for health care organizations in a competitive environment by reducing repeat business, generating negative word of mouth, and producing low patient care quality ratings."[10] Communication and coordination of care are vital aspects to consider, and there could be less risk of failure when there are fewer people to keep informed.

In a retrospective study by Toney et al,[8] they examined the outcomes and cost efficiency when patients were seen by two or fewer clinicians opposed to 3 or more. The result of the study indicated that as more clinicians were added to the treatment of a patient, more visits were needed to achieve the same outcomes. With seasoned clinicians, there is still a level of familiarity necessary in order to be efficient even with the most thorough documentation and communication practices. Recommendations developed from this study included limiting the number of clinicians that a patient sees and limiting the use of physical therapist assistants for less than 50% of the visits.[8] Patients who experience a lack of continuity in their care will encounter a poorer professional relationship between themselves and

the therapist. This can lead to problems with communication, trust, and difficulty for the therapist to reassess the patient.[3]

CONCLUSION

Continuity of care is a fundamental concept of patient care in physical therapy. There are several challenges that prevent some clinics from consistently scheduling patients with the same clinician or group of clinicians; however, it is a model of scheduling to strive for. "Senior and clinical managers should encourage an organizational culture that puts continuity ahead of convenience."[3]

Familiarity of the patient leads to coordinated care, more efficient treatment, and high patient satisfaction. A clinician who is familiar with the patient can more easily identify variations that may appear and attend to problems sooner than if one is unaware of the patient's typical responses. The ultimate continuity of care would be for the same therapist to always see the same patients, but realistically instances are going to arise that will preclude that from happening. The situation with using therapy teams, allows for flexibility while also allowing physical therapists and assistants to work to the extent of their professional licenses. Using only two clinicians to provide care provides a level of continuity that allows for development of patient-provider relationship including communication and trust.

ACKNOWLEDGMENTS

This case report was completed as a portion of my education to earn a tDPT degree from the University of New England. During this class, Suzanne R. Brown, MPH, PT, was my advisor, and provided me with editing assistance and support. I would also like to acknowledge Cynthia R. Rumsey, PTA, who is my co-worker at Inland Hospital, Waterville, ME and assisted me in the care of this patient.

REFERENCES

1. Beattie P, Dowda M, Turner C, Michener L, Nelson R. Longitudinal continuity of care is associated with high patient satisfaction with physical therapy. *Phys Ther*. 2005;85(10):1046-1052.
2. Hall AM, Ferreira PH, Maher CG, Latimer J, Ferreira ML. The influence of the therapist-patient relationship on treatment outcome in physical rehabilitation: a systematic review. *Phys Ther*. 2010;90(8):1099-1110.
3. Russell D, Rosati RJ, Andreopoulos E. Continuity in the provider of home-based physical therapy services and its implications for outcomes of patients. *Phys Ther*. 2012;92(2):227-235.
4. McCauley K, Irwin RS. Changing the work environment in intensive care units to achieve patient-focused care: the time has come. *Am J Crit Care*. 2006;15(6):541-548.
5. Joint Commission Center for Transforming Healthcare. http://www.centerfortransforminghealthcare.org/projects/detail.aspx?Project=1. Accessed July 28, 2012.
6. Nothnagl T, Leeb BF. Diagnosis, differential diagnosis and treatment of polymyalgia rheumatica. *Drugs Aging*. 2006;23(5):391-402.
7. American Physical Therapy Association. Guide to physical therapist practice. 2nd ed. *Phys Ther*. 2001;81(1):9-746.
8. Toney JW, Borgman D. The relationship between practice management standards and outcomes, efficiency and cost effectiveness in the treatment of patients with shoulder impairments. *Phys Ther J Policy Admin Leadersh*. 2011;11(4).
9. Studer Q. *Hardwiring Excellence*. Gulf Breeze, FL: Fire Starter Publishing; 2003.
10. Weinberg DB, Gittell JH, Lusenhop RW, Kautz CM, Wright J. Beyond our walls: impact of patient and provider coordination across the continuum on outcomes for surgical patients. *Health Serv Res*. 2007;42(1 Pt 1):7-24.

A Clinical Reasoning Approach and Retrospective Case Study of a Humeroradial Joint Dysfunction

Anne Lea Morgan McKinstry, PT, OCS, FAAOMPT[1]
Brenda Matter, PT, OCS, FAAOMPT[2]

[1]Clinical Education Instructor, Olympic Physical Therapy, Bellevue WA
[2]Physical Therapist Manager and Co-Owner, Sound Physical Therapy, Seattle, WA

ABSTRACT

Lateral elbow pain is a common problem with both traumatic and repetitive use causes that is frequently referred to physical therapy. It can occur with or without other upper extremity (UE) injury and dysfunction. The complexity of the 3 joint elbow makes accurate diagnosis and effective treatment of lateral elbow pain a challenge. A skilled orthopaedic evaluation is essential to identify the specific tissue involved and can be used to determine appropriate treatment of the involved tissue. In this case report, a patient who had lingering lateral elbow pain from playing high level doubles tennis had symptoms essentially resolve with one treatment. Clinical reasoning followed the North American Institute of Orthopedic Manual Therapy (NAIOMT) guidelines. A Mulligan mobilization with movement (MWM) is described. Immediate relief was achieved by the patient.

Key Words: lateral elbow pain, tennis elbow, joint line tenderness, mobilization with movement, radio-humeral joint

INTRODUCTION

Lateral elbow pain is a problem treated by physical therapy. It commonly occurs in various sports with upper extremity (UE) use, and with repetitive stress in work and home activities. A common medical diagnosis given for lateral elbow pain is "lateral epicondylitis" or "tennis elbow."[1-4] Typically, these diagnoses refer to a lesion of the common extensor tendon. A systematic differential diagnosis of the lateral elbow structures should identify whether a lesion of the contractile motor unit is, in fact, present. There are many conditions that present as lateral elbow pain (lateral epicondylalgia). A skilled evaluation using palpation and movement can determine which structures are involved.[5-12]

The elbow is a 3 joint complex including the humeroulnar, humeroradial, and radioulnar joints. It has been variously described as a "3 joint compound synovial joint" or a "uniaxial hinge joint" that shares a continuous joint space and a common joint capsule.[13,14] The elbow bony complex is highly congruent and also depends in part on soft tissue restraints for control of movement. An injury to one part can affect the other components.[15,16] There is a continuous structural relationship between the muscle attachments near the elbow joint and the ligaments and joint capsule.[8,13,16] Palpation of the elbow requires familiarity of where structures lie under the skin using bony landmarks as a guide. Bony landmarks in the lateral elbow are the lateral epicondyle of the humerus and the radial head. It is important to be able to locate the humeroradial joint line (Figure 1), which can be palpated proximal to the radial head (Figure 2). Abnormal joint biomechanics can lead to pain, irritation, and palpable tenderness in any of the related structures.[7] A comprehensive evaluation should include specific differential tissue testing to identify the injury along with taking a careful history to help to determine a cause and facilitate treatment.[6,9,16]

The purpose of this paper is to describe an evaluation approach to differential diagnosis of the lateral elbow structures and identification of the tissues at fault. A literature search using PubMed, PEDro, CINAHL, Cochrane library, and APTA "Hooked on Evidence" or consulting athletic injury textbooks did not reveal any injuries, diagnoses, or treatments specific to doubles tennis. However, references were found using the search terms: lateral elbow pain, lateral epicondylitis, lateral epicondylalgia, osteochondritis, osteochondrosis, tennis elbow, lateral elbow dysfunctions, lateral elbow treatments, lateral elbow treatments in physical therapy, lateral elbow treatments with manipulations. The authors concluded that the mechanisms of injury incurred in doubles tennis have not been adequately described.

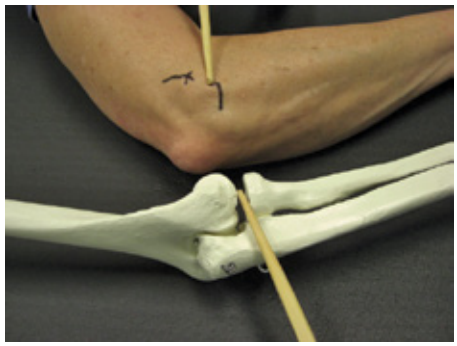


Figure 1. Humeroradial joint line.

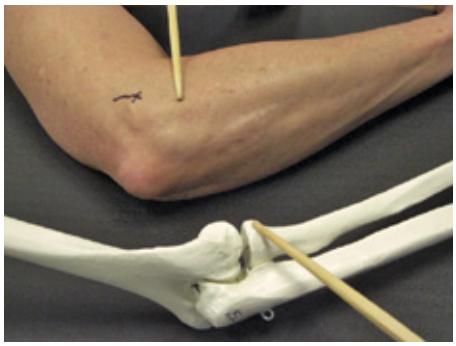


Figure 2. Radial head. Also note on the humerus of the human figure the line of the lateral supracondylar ridge ending in the capitellum marked by "x".

CASE PRESENTATION

Subjective History

The patient history is a 50-year-old woman who is an experienced amateur tennis player, playing primarily doubles tennis. She was referred to physical therapy 6 weeks post onset of symptoms. Initially symptoms developed suddenly during a doubles game and persisted over several weeks. The symptoms consisted of sharp pain with certain tennis strokes and a vague dull ache with some activities of daily living (ADLs). As the patient continued to play, she noticed that symptoms were only present with forehand ground strokes and even more apparent with forehand volley shots. In the next few days, subsequent attempts to play tennis were hindered due to reproducible symptoms with the above mentioned

strokes. The patient then ceased all tennis activity until her visit to physical therapy. She had no other physical limitations and could carry out all ADLs, despite persistent, vague, and mild lateral elbow ache with certain motions that were not easily identifiable. No imaging studies were reported. Past medical history included one episode of "tennis elbow"[2] years ago in the same arm. The patient clearly stated that current symptoms were very different in nature to that prior episode, which fully resolved. Other medical history is unremarkable when questioned about recent and or past elbow trauma, general infections, bowel or bladder changes, cervical spinal injury/concerns, and cancer. Other red flags, including systemic, autoimmune, cardiac, or diabetes, were ruled out with subjective history intake. Patient reported taking no medication currently and had no history of steroid use. The goal for this patient was to return to tennis and all ADLs with no symptoms.

Evaluation and Treatment Plan

In the evaluation, no grossly obvious arthrokinematic, bony, or musculotendinous lesions at the elbow were found and there was no evidence of cervical and/or neurological involvement (Table 1). Passive articular movements (PAMs) were normal and passive combined motions of flexion or extension with supination or pronation were painless and exhibited full range. A fracture was unlikely as the tuning fork test was negative and the history did not include any significant trauma to suggest even a possible stress fracture. According to Lesho,[24] tuning fork tests can be negative if there is not a mechanical disruption of cortical bone, which occurs in the later stages of a stress fracture. As symptoms had been present for 6 weeks prior to Physical Therapy and the patient had no complaints of any progressive symptoms along with a negative tuning fork test, we surmised there was no reason for referral for imaging at that point. Grip strength and the manual muscle test (MMT) were strong and painfree, and the visual inspection of superficial tissues appeared to be normal. Symptoms with ADLs were consistently mild even after 6 weeks postinjury and the subjective history was not suspicious for serious medical pathologies. Radial tunnel syndrome was ruled out with appropriate neurological testing, along with lack of tenderness over the supinator muscle and painful resistance to supination.[7,13,26] Upper quadrant and cervical scan was negative for serious pathology or neurological contribution to the elbow dysfunction.[5,9,10] Compensation and dysfunction of the shoulder girdle was ruled out.[9] Wrist or elbow sprains or strains were ruled out, along with fat pad impingement, posterolateral rotatory instability, and abducted ulna.[9] The possibility of osteochondrosis or "loose body" was unlikely because no crepitus was noted with active or passive ROM, specific traction and compression to the humeroradial joint reproduced no symptoms, and there was no history of the joint "locking."[13,27,28] Despite a lack of significant manual test findings, and due to the presence of joint line tenderness and pain with certain activities, the therapist reasoned that there must be a mild, difficult to detect joint dysfunction that was worth attempting the treatment plan described below.

In the treatment plan a Mulligan movement with mobilization (MWM)[29,30] was selected initially to provide a hypoalgesic effect and restoration of possible subtle loss of joint function. Mulligan's theory suggests there does not have to be a gross joint positional fault for there to be significant symptoms at that joint.[30] Therefore, in this situation, even a suspected subtle loss of joint articular motion accompanied by pain with function could be worth a treatment attempt with MWM. According to Vincenzino and Wright's single case study,[29] the fundamental rule of Mulligan's MWM techniques is to restore painfree function. Determining a prognosis at the time of treatment was difficult due to a lack of data in the literature on patients with a similar presentation. It was felt by the therapist that reassessment would be a necessary part of the plan of care to provide a more accurate prognosis based on clinical reasoning and response to care.

Table 1. Upper Quadrant Screening Performed as per NAIOMT Guidelines[9,10]

Test performed	Results
Cervical spine upper quadrant scan exam as per NAIOMT[9,10]	Clear and unremarkable for deep tendon reflexes testing, segmental strength ie: key muscle MMT, sensory testing, vascular issues, foraminal compression, signs of cervical radiculopathy, serious cervical pathology, upper motor neuron, lower motor neuron, segmental ligamentous and stress testing.
Visual examination	No swelling, bruising, rubor, calor, discoloration, malalignment or muscle atrophy noted.
Elbow and wrist joint ROM	Active, passive and combined ROM essentially full but vague aching reproduced at end ranges.
Elbow and wrist contractile lesion testing	Negative for positive findings even in the lengthened state except for vague aches similar to baseline complaints.
Forearm grip and pinch strength	WNL with vague aching reproduced.[17]
Upper Limb Neural Tension Testing	Negative.[18]
Shoulder ROM and girdle mechanics	WNL, including assessment of upper quadrant motor control.[19]
Passive articular movements	PAMs appeared to be full and WNL with testing. The glides did not feel abnormal.[6,20,21]
Elbow and wrist stress testing	Joint compression, capsular traction and all ligament stress tests were negative.[6,7,11]
Palpation	Definite tenderness to palpation only along the humeroradial joint line, especially underneath the extensor mechanism.[22,23]
Special tests	Tuning fork testing to the radial head and humeral epicondyle for fractures was negative.[24]
Sensory testing for UE peripheral nerve entrapment	Negative.
Outcome Measure	VAS 3/10.[25]
Abbreviations: NAIOMT, North American Institute of Orthopedic Manual Therapy; MMT, manual muscle test; ROM, range of motion; WNL, within normal limits; PAM, passive articular movements; UE, upper extremity; VAS, visual analogue scale	

Treatment

Three treatments were performed within two weeks. The first treatment consisted of the evaluation with no manual technique performed. However, explicit instructions were given for the patient to monitor the elbow area for the delayed onset of symptoms following the stresses applied to the elbow in the evaluation.

At the second treatment, the patient reported no change for better or worse. The MMT was still within normal limits, and vague pain was still present with palpation along the humeroradial joint line as well as with elbow and wrist contractile lesion testing. The patient stood at the edge of the treatment table with both hands on the table, palms down, fingers extended away from the body (Figure 3). The Mulligan MWM techniques were performed. The first technique (Figure 4) is not in Manual Therapy, Nags, Snags, MWM, etc. by Brian Mulligan, FNZSP (Hon), Diploma M.T., but was demonstrated in a Mulligan class by Don Reardon, MS, PT, OCS, CMP, MCTA, an instructor for the Mulligan Institute.[31] The patient then straightened her elbow in preparation for the second technique (Figure 5 & Figure 6). In both the first and second techniques, the therapist applied slight nonpain provoking overpressure at the end of extension/anterior rotation with each repetition. There were 3 sets of repetitions; one after each technique, then the third set of 10x MWM repetitions was performed similar to the first technique.[29-32]

During the Mulligan technique, there was an audible "click" and a report of an immediate decrease in symptoms with reassessment of palpation and contractile units. Joint glides were reassessed and again had normal findings. Modalities of ice and 20% pulsed ultrasound were used for anticipatory anti-inflammatory and pain relief measures and to promote tissue healing following the manual technique as per standard physical therapy practice. Patient was sent home with instructions for icing and forearm bracing with soft support and avoiding all provocative activities. Patient returned for the third and final visit and joint line tenderness was essentially resolved. Patient reported diminished symptoms with all ADLs. She had not yet returned to tennis. The Visual Analog Scale (VAS) was 0/10. Patient was instructed in the use of an external soft brace support along with optional use of taping during provocative activities, including tennis.[33,34] Exercise instruction consisted of concentric and eccentric resistive exercises as a precautionary measure to promote appropriate neuromuscular re-education of the elbow area and to return to maximal function.[35-38] The patient was instructed to return to physical therapy if symptoms reoccurred. The patient was contacted several times in the following 6 months and she reported being nonsymptomatic and with full function including tennis. The treatment choice quickly relieved the patient's pain with tennis and had painfree ADLs after several weeks of dysfunction, allowing the patient to return directly to tennis.

Figure 3. The practitioner stands to the side of the patient and slightly posteriorly, placing both thumbs (one on top of the other) on the posterior radial head just below the joint line. The patient then bends upper trunk downwards to slightly flex the elbow. The technique is described and the pictures referenced as the technique evolves.

Figure 4. The direction of the MWM is posterior to anterior on the radial head as the patient straightens up, extending and rotating the cubital fossa in an anterior/lateral direction. This is repeated 10x per the Mulligan parameters.

Figure 5. The second technique begins with the patient's elbow in extension and practitioner with same position of thumbs.

Figure 6. Patient rotates cubital fossa alternately from posterior/medial to antero/lateral while the therapist maintains contact through the thumbs.

DISCUSSION

When a patient reports that they were injured while playing tennis, the assumption may be that the injury occurred because of a problem with technique, such as a malfunctioning singles backhand stroke or excessive top spin on a forehand stroke. These are the most frequently reported mechanisms of injury in the literature and the ones most studied.[15,16] According to the literature, the patient's reported symptomatic forehand strokes are not the usual cause of lateral epicondylalgia.[15,16]

While analyzing the mechanism of this particular injury, the authors also considered several theories of abnormal neuromotor control. These theories propose that optimal function of interrelated body parts is needed for each unit to perform properly.[19,20,35-38] According to Kapandji,[20] the arm is at its weakest when the elbow is extending while the shoulder is flexing or pivoting forward. Sahrmann[19] writes that faulty mechanics at any joint or surrounding tissue can lead to dysfunction if not performed correctly each and every time. Commerford and colleagues[37,38] discusses the global muscle system and how the full functioning of this system impacts the local muscle system that controls each joint. In their work, Kibler and Sciasia[36] examine how the segments distant from the elbow in the kinetic chain

participate in a coordinated fashion to generate force and assist in regulating load at the elbow during unilateral rapid arm movements in sports. In addition, according to a conversation with L. Moldrem, a USTA certified tennis professional, the mechanism of the tennis strokes vary whether playing singles or doubles and also depends on the level of skill of the player (Spring 2008). Consideration of all these theories of motor control may explain how the forces of any one type of tennis stroke can increase stresses on the elbow.

As tennis players are among those at greatest risk for developing true lateral epicondylitis, ruling out injury to the musculotendinous wrist extensor unit is the first and foremost part of the evaluation.[6,9,11,16] Testing of these specific tissues was negative in this case. Further evaluation ensued to help determine the underlying reason for the symptoms and attempt to differentiate the tissue at fault so that appropriate treatment could be applied.[6,9,11]

In the estimation of the treating therapist, the joint appeared to have a normal capsular end feel. Arthrokinematic loss would have been expected and was tested for but not clearly identified. A subtle but undetectable capsular or cartilaginous dysfunction may have caused a minimal loss of motion at the end of one of the anatomical ranges.[20,21] Due to the nature of the symptoms and mechanism of injury, the loss of motion was still suspected although not appreciated in the manual test, giving the appearance of normal range. With the shape of these joint surfaces as a classic synovial ovoid, if there had been a mid range cartilaginous or bony pathology, the findings would have been consistently evident and reproducible. In this case, major positive findings only included painful palpation of the humeroradial joint line, and a vague mild ache reported during any contractile unit testing creating compressive forces across the elbow. Through deductive reasoning and consideration of the symptom pattern, especially the humeroradial joint line tenderness, the therapist concluded that there was a probable joint dysfunction with abnormal accessory glide distant to the center of axis of motion, and therefore difficult to detect.

A Mulligan MWM treatment technique[29-31]was selected instead of a high velocity low amplitude (HVLA) technique,[6,9] because Mulligan's theory suggests MWM techniques work in the absence of a gross joint positional fault. An HVLA technique is more commonly used when there is an arthrokinematic hard end feel and restriction to the glide in one direction which was not perceived in this assessment. The practitioner decided that despite the patient being safe for a HVLA manipulation, the MWM technique was more appropriate as an initial approach.[39,40] It was felt the HVLA could be used at a later date as a more specific technique if warranted. In either case, it was felt that the patient might benefit from the hypoalgesia effect than any manipulation (including MWM) can provide as well as correcting the suspected positional fault.[41-45] In addition, as the patient was able to return to playing tennis without further symptoms, proprioceptive upper quarter exercise instruction was deemed unnecessary.

CONCLUSION

The condition the patient presented with was unusual as the only significant objective finding was tenderness at the humeroradial joint line. Some small level of arthrokinematic dysfunction was suspected as a cause, although no gross arthrokinematic abnormalities were found. Deductive reasoning suggested that attempting the use of the MWM technique initially could restore normal joint motion and provide a hypoalgesia effect.[29,30,40-45] The HVLA technique was considered as an appropriate treatment choice, but in this case it was not chosen. This patient had a onetime onset that did not reoccur after the initial course of physical therapy. We believe that because of the skilled orthopaedic evaluation following NAIOMT guidelines, the treatment was efficient and effective.[9,10] If the condition had reoccurred, then the practitioner would have re-evaluated the cervical and thoracic spine, shoulder, wrist, and related structures for dysfunction and compensation patterns that would affect the elbow.[3,5,9,35-38] If re-evaluation found similar findings as the first evaluation, use of HVLA techniques would have been reconsidered for their hypoalgesic effect. Referring back to the MD for further imaging would also have been considered.

REFERENCES

1. Waugh EJ. Lateral epicondylalgia or epicondylitis: What's in a name? *J Orthop Sports Phys Ther*. 2005;35:200-202.
2. Stanislopoulos D, Johnson M I. Cyriax physiotherapy for tennis elbow/lateral epicondylitis. *Br J Sports Med*. 2004;38:675-677.
3. Vincenzino B. Lateral epicondylalgia; a musculoskeletal physiotherapy perspective. *Man Ther*. 2003;8:66-79.
4. Stasinopoulos D, Johnson MI. Lateral elbow tendinopathy is the most appropriate diagnostic term for the condition commonly referred to as lateral epicondylitis. *Med Hypotheses*. 2006;67(6):1400-1402.
5. Cleland J, Whitman J, Fritz J. Effectiveness of manual physical therapy to the cervical spine in the management of lateral epicondylalgia: a retrospective analysis. *J Orthop Sports Phys Ther*. 2004;34:713-722.
6. Windsor B. High velocity thrust technique for traumatic onset lateral elbow pain. *J Man Manip Ther*. 2006;14:1:37-47.
7. Lee D. Tennis elbow, a manual therapist's perspective. *J Orthop Sports Phys Ther*. 1986;8:134-142.
8. Kushner S, Reid, D. Manipulation in treatment of tennis elbow. *J Orthop Sports Phys Ther*. 1986;7:264-272.
9. Hoke AP, Pettman E. *North American Institute of Manual Therapy Course Notes: Differential Diagnosis LI, Upper Quadrant LII and III.* 1992 to 2002.
10. Meadows JTS. *Orthopedic Differential Diagnosis in Physical Therapy: A Case Study Approach.* New York, NY: McGraw-Hill; 1999.
11. Cleland J. *Orthopaedic Clinical Examination: An Evidence-Based Approach for Physical Therapists*. Waltham, MA: Saunders/ Elsevier; 2007.
12. Labelle H, Guibert R, Joncas J, Newman N, Fallaha M, Rivard CH. Lack of scientific evidence for treatment of lateral epicondylalgia: An attempted meta-analysis. *J Bone Joint Surg Br*. 1992;745:646-651.
13. Reid DC. *Sports Injury Assessment and Rehabilitation*. New York, NY: Churchill-Livingston; 1992.
14. Williams PL. *Gray's Anatomy*. 38th ed. New York, NY: Churchill-Livingston; 1995:623-646.
15. Eygendaal D, Rahussen FT, Diercks RL. Biomechanics of the elbow joint in tennis players and relation to pathology. *Br J Sports Med*. 2007;41:820-823.
16. Noteboom T, Cruver R, Keller J, Kellogg B, Nitz AJ. Tennis elbow: a review. *J Orthop Sports Phys Ther*. 1994;19(6):357-366.
17. Smidt N, van der Windt DA, Assendelft WJ, et al. Interobserver reproducibility of the assessment of severity of complaints, grip strength, and pressure pain threshold in patients with lateral epicondylitis. *Arch Phys Med Rehabil*. 2002;83:1145–1150.
18. Butler DS. *Mobilisation of the Nervous System*. London, England: Churchill-Livingstone, Medical Division of Longman Group UK Limited; 1991.
19. Sahrmann S. *Diagnosis and Treatment of Movement Impairment Syndromes.* St. Louis, MO: Mosby; 2002:9-50.
20. Kapanji IA. P*hysiology of the Joints. Vol. 1: Upper Limb*. 2nd ed. Baltimore, MD: Williams &Wilkins; 1970.
21. Fryette HH. Principles of osteopathic tech-

nique. *Orthopaedic Newsletter*. 1980:7.
22. Rose RE. The accuracy of joint line tenderness in the diagnosis of meniscal tears. *West Indian Med J*. 2006;55(5):323-326.
23. Konan S, Rayan F, Haddad FS. Do physical tests accurately detect meniscal tears? *Knee Surg Sport Tr A*. 2009;17:806-811.
24. Lesho EP. Can tuning forks replace bone scans for identification of stress fractures? *Mil Med*. 1997;162(12):802-803.
25. Gould D, Kelly D, Goldstone L, Gammon J. Information point: Visual Analogue Scale (VAS). *J Clin Nurs*. 2001;10(5):697-706.
26. Ekstrom RA, Holden K. Examination of and intervention for a patient with chronic lateral elbow pain with signs of nerve entrapment. *Phys Ther*. 2002;82(11):1077–1086.
27. Brown R, Blzina ME, Kerlan RK, Carter VS, Jobe FW, Carlson GJ. Osteochondrosis of the capitellum. *J Sports Med*. 1974;2(1): 27-46.
28. Singer K, Roy S. Osteochondrosis of the humeral capitellum. *Am J Sport Med*. 12:(5):351-360.
29. Vincenzino B, Wright A. Effects of a novel manipulative physiotherapy technique on tennis elbow; a single case study. *Man Ther.* 1995;1:30-35.
30. Mulligan BR. *Manual Therapy Nags, Snags, MWM, etc.* 4th ed. Wellington, NZ: Plane View Services Ltd; 1992:94-97.
31. Reordan DK. *Course Notes: Brian Mulligan Concepts for Spinal and Peripheral Joints*. 9/15,16/2001, and 11/3,4/2001; sponsored by Olympic Physical Therapy, Seattle WA.
32. Hing W. Mulligan's mobilization with movement: a review of the tenets and prescription of MWMs. *New Zeal J Physio*. 2008;36(3):144-164.
33. Forbes A, Hopper D. The effect of counterforce bracing on grip strength in tennis players with painful elbows. *J Physiother*.1990;36(4):259-265.
34. Walther M, Kirschner S, Koenig A, Barthel T, Gohlke F. Biomechanical evaluation of braces used for the treatment of epicondylitis. *J Shoulder Elbow Surg*. 2002;11(3):265-270.
35. Gibbons SGT, Mottram SL, Comerford B. Stability and movement dysfunction related to the elbow and forearm. *Orthop Division Rev*. 2001; September/October.
36. Kibler WB, Sciascia A. Kinetic chain contributions to elbow function and dysfunction in sports. *Clin Sport Med*. 2004;23:545-552.
37. Comerford M, Gibbons SGT. Strength vs. Stability: Part 1: concepts and terms. *Orthop Division Rev*. 2001;March/April:21-27.
38. Comerford M, Gibbons SGT. Strength vs. stability: Part 2: limitations and benefits. *Orthop Div Rev*. 2001;March/April:29-33.
39. Herd CR, Meserve BB. A systematic review of the effectiveness of manipulative therapy in treating lateral epicondylagia. *J Man Manip Ther*. 2008;16(4):225-237.
40. Hsieh C-Y, Vincenzino B, Hu M-H, Yang C. Mulligan's mobilization with movements for the thumb: a single case report using magnetic resonance imaging to evaluate the positional fault hypothesis. *Man Ther.* 2002;7(1):44-49.
41. Paungmali A, O'Leary S, Souvlis T, Vicenzino B. Hypoalgesic and sympathoexcitatory effects of mobilization with movement for lateral epicondylagia. *Phys Ther*. 2003;83(4): 374-383.
42. Vicenzino B, Cleland JA, Bisset L. Joint manipulation in the management of lateral epicondylalgia: a clinical commentary. *J Man Manip Ther*. 2007;15(1):50-56.
43. Vicenzino B, Paungmali A, Buratowski S, Wright A. Specific manipulative treatment for chronic lateral epicondylalgia produces uniquely characteristic hypoalgesia. *Man Ther*. 2001;6(4):205-212.
44. Paugmali A, Vincenzino B, Smith M. Hypolgesia induced by elbow manipulation in lateral epicondylalgia does not exhibit tolerance. *J Pain*. 2003;4(8):449-454.
45. Vincenzino B, Collins D, Benson H, Wright A. An investigation of the interrelationship between manipulative therapy-induced hypoalgesia and sympathoexcitation. *J Manip Physiol Ther.* 1998;21(7):448-453.

Determining the Most Effective Feedback Method in Teaching Subjects to Selectively Activate the Transversus Abdominis: A Randomized Controlled Trial

Ashley Herlocker, PT, DPT[1]
Naomi Coffman, PT, DPT[2]
Michole Mainer, PT, DPT[3]
Sara Beth Pertain, PT, DPT[4]
Nancy Wofford, PT, DPT, OCS, Cert MDT[5]
Myka Campbell, MEd, RDMS, RT(R)[6]
Andi Beth Mincer, PT, EdD[7]
David Lake, PT, PhD[8]

[1]Physical Therapist, North Valdosta Therapy Services, Valdosta, GA
[2]Physical Therapist, Lafayette Physical Therapy
[3]Physical Therapist, Memorial University Medical Center
[4]Physical Therapist, United Rehab, UHS Pruitt
[5]Assistant Professor, Department of Physical Therapy, Armstrong Atlantic State University, Savannah, GA
[6]Diagnostic Medical Sonography Program Coordinator, Department of Radiological Sciences, Armstrong Atlantic State University, Savannah, GA
[7]Associate Professor, Department of Physical Therapy, Armstrong Atlantic State University, Savannah, GA
[8]Professor, Department of Physical Therapy, Armstrong Atlantic State University, Savannah, GA

ABSTRACT

Background and Purpose: The purpose of this randomized controlled trial was to determine the most effective form of feedback for teaching subjects to preferentially activate the TrA (transversus abdominis). **Methods:** Subjects were randomly assigned to one of 3 feedback groups: verbal, blood pressure cuff, or rehabilitative ultrasound imaging (RUSI). Subjects received a training session with assigned biofeedback. Transversus abdominis activation was measured pre- and posttraining and 2 to 4 days later using RUSI. **Findings:** All groups showed significant within subject effects for preferential activation of the TrA over time (p=0.006), and significant improvements in preferential activation of the TrA between pretraining to posttraining. **Conclusion:** All 3 forms of feedback are equally effective at teaching asymptomatic individuals to selectively activate the TrA. **Clinical Relevance:** Verbal and blood pressure cuff feedback are convenient, cost effective methods for administering a core stabilization program with TrA selective activation.

Key Words: rehabilitative ultrasound imaging, biofeedback

INTRODUCTION

Low back pain (LBP) is a widespread, clinical problem. According to Katz,[1] "only the common cold exceeds back pain in terms of the frequency of complaints that are heard by primary care physicians." Low back pain was the most frequent type of musculoskeletal pain reported in the National Health Interview Survey conducted in 2002.[2] According to the survey, about a fourth of responders had LBP over a 3-month period.[2] Risk factors for LBP include depression, anxiety, obesity, smoking, older age, and having a demanding job.[1]

Low back pain also imposes a tremendous socioeconomic burden. In the United States alone, the cost of LBP is over $100 billion each year.[1] The vast majority of these costs can be attributed to secondary causes such as decreased productivity and lost earnings due to missed work.[1] The remainder of these expenditures include office visits (average $150/visit), medical admissions (average $9,000/admission), and surgical procedures (which range from $14,000 to $37,000/surgery).[1]

Transversus abdominis (TrA) weakness may contribute to the development of LBP. Individuals who suffer from LBP often have difficulty activating the TrA correctly and have a significant decrease in the cross sectional area of the TrA during contraction.[3-8] In healthy individuals, the trunk muscles are activated just prior to limb movements, and the TrA is always the first of the trunk muscles to contract.[7] In individuals with LBP, TrA contraction is significantly delayed with upper extremity movement in all directions.[7]

In those who already have LBP, a core stabilization program targeted at selective activation of the TrA has been linked with decreased pain and disability scores, as well as improved function.[9] Hides and colleagues[9] conducted a randomized controlled trial of the long-term effects of core stabilization training and reported that subjects who received specific training of the TrA and multifidus had lower reoccurrences of LBP after 3 years when compared to a medical management group.

Several methods have been employed to teach patients how to correctly activate the TrA, but evidence for the use of these techniques has been unclear. One of the most basic feedback tools is verbal feedback. The abdominal drawing-in maneuver (ADIM) is a set of verbal instructions consisting of asking the patient to "pull your belly button in toward your spine."[10,11] The ADIM has been shown to be an effective technique for activating the TrA apart from the more superficial abdominal muscles with minimal movement of the spine.[10-15] The verbal instructions given during the ADIM provide valuable feedback for helping individuals learn to correctly activate the TrA, but these verbal cues alone may be time consuming and may not be optimal for everyone.

Another tool that is commonly used to teach TrA activation is the pressure biofeedback unit (PBU). The PBU can be used to measure activation of the TrA and to monitor unwanted spinal and pelvic movements in the prone and supine positions.[16] Although the PBU is commonly used, assessment of its reliability is difficult due to poor standardization of the protocol.[17-19] A recent study by Glasoe et al[20] showed that a blood pressure cuff was able to register pressure changes when performing prone lumbar stabilization exercises just as effectively as a commercially produced PBU.

One other form of biofeedback that is becoming increasingly popular is rehabilitative ultrasound imaging (RUSI). Ultrasonic assessment of the abdominal muscles is a noninvasive way to indirectly measure

contraction of the TrA, as well as provide realtime feedback to subjects undergoing a core stabilization program.[10,15,21,22] The use of RUSI as a quantitative measurement device has been proven to be reliable, but studies examining the use of RUSI as a biofeedback device have been inconclusive.[14,15,21,23-26]

Teyhen et al[15] examined the effectiveness of RUSI as a biofeedback tool in subjects with LBP. After baseline measurements of the TrA were taken, all subjects were trained in performing the ADIM using verbal instructions. Subjects were then randomized into either a traditional training group or a RUSI biofeedback group. After one training session with the randomly assigned feedback method, the ability to selectively contract the TrA was reassessed. Results of this study showed that the addition of RUSI as a biofeedback tool was no more effective than traditional training (verbal feedback) alone. However, subjects in both groups were trained military personnel who were able to preferentially activate the TrA prior to receiving any training, which was cited as a limitation of the study.[15]

To the researcher's knowledge, no studies have been conducted that have compared the efficacy of verbal feedback, the blood pressure cuff, and RUSI as feedback devices in teaching subjects to selectively activate the TrA. Therefore, the purpose of this randomized controlled trial was to determine, in an initial training session, whether one of these methods was more effective than another for instructing asymptomatic, untrained subjects to selectively activate the TrA. Researchers hypothesized that biofeedback using RUSI and/or the blood pressure cuff during the initial training session would be more effective than verbal feedback alone in helping untrained subjects to selectively activate the TrA.

METHODS

Subjects

After approval was granted by the Armstrong Atlantic State University Institutional Review Board, subjects were recruited through fliers and campus wide e-mail notifications. Subjects included asymptomatic individuals between the ages of 18 and 40 who did not perform abdominal workouts more than once a week and had no reports of LBP or back injury within the last year. Those with a history of cancer, recent spinal surgery, spinal deformity, known neuromuscular disease, a body mass index of 30 or greater, or previous experience with core stabilization administered by a physical therapist were excluded from the study. Women that were pregnant or could possibly be pregnant were also excluded. Thirty-eight subjects (27 females, 11 males) were included in this study.

After signing an informed consent, each subject chose a sealed envelope containing one of the following group assignments: verbal feedback only, verbal feedback plus blood pressure cuff biofeedback, and verbal feedback plus RUSI biofeedback. The verbal feedback group served as the control in this study since they received no additional form of feedback.

Before the initial testing session, all subjects watched a brief video explaining the location and proposed role of the TrA in core stabilization, as well as the procedures for the initial testing session. During the video, instructions for performing the abdominal drawing in maneuver were given, and compensatory mechanisms were explained in order to avoid unwanted movement of the lumbar spine. Compensatory mechanisms included performing a Valsalva maneuver, tilting the pelvis, and pressing down through the feet.[4,16,27,28]

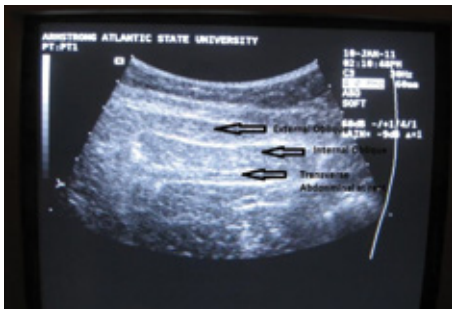
Procedure

Ultrasound measurements

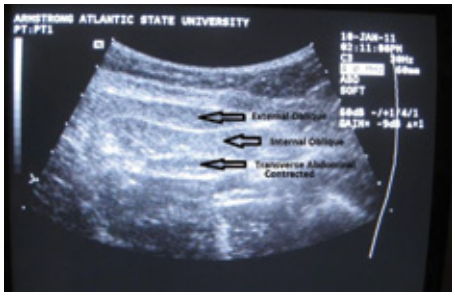
The ultrasound imaging and measuring protocol from Teyhen et al[15] was followed during this study. Muscle thickness measurements were taken with the subject in the supine hooklying position, with the examiner and ultrasound machine on the right side of the subject. An Acuson Aspen (Mountain View, California) ultrasound machine and a curvilinear 3 MHz transducer with a frequency range of 2.5-4 MHz were used to obtain measurements. B-mode ultrasound, a low frequency setting, and a curvilinear array were chosen for use in this study because these settings are optimal for measuring deep structures, such as the TrA.[22]

Transducer placement for the most clear view of the TrA was determined to be directly above the right iliac crest along the axillary line. To ensure a standardized image for each subject, the thoracolumbar fascia was visualized on the far left side of the ultrasound screen. Once an acceptable image of the abdominal musculature was obtained, the image was frozen to allow for accurate measurements. The transducer was not moved from its location on the subject's abdomen. Measurements were taken where the TrA was thickest and as close to the center of the image as possible. Because respiration affects abdominal muscle thickness, measurements were taken at the end of an exhalation during all trials. The distance between the hyperechoic fascial lines that mark the superficial and deep borders of each muscle were measured using electronic calipers on the ultrasound machine. The thickness of the TrA and a combined measurement of the external oblique (EO) and internal oblique (IO) were taken during each trial of rest and contraction.

Resting:



Contracted:



Reliability analysis

Examiners consisted of 4 physical therapy students trained by a Registered Diagnostic Medical Sonographer in ultrasound imaging for several sessions prior to the start of the study. To minimize bias and allow for blinding, two teams of two examiners performed the measurements. Each team consisted of an Examiner 1 and Examiner 2. Examiner 1 measured the muscle thickness values with the ultrasound machine. Examiner 2 administered instructions and positioned the transducer to obtain an optimal image on the screen. An initial pilot study was conducted to assess intrarater and interrater reliability between the two teams of examiners. Twenty trained subjects were included in the pilot study. Each team took one set of abdominal muscle thickness measurements (isolated TrA and combined EO and IO, both at rest and during contraction), and then alternated with the other team for a total of 6 measurements at rest and during contraction. Each team was blinded to the other's results. To obtain inter-image reliability, each team acquired a different image

after each measurement. This accounted for potential errors associated with finding the image and measuring appropriately, such as placement of the ultrasound transducer, the amount of pressure applied to the soft tissue, when to freeze the image, the location of anatomical landmarks delineating the different muscle layers, and the precise control of on-screen calipers.

Baseline assessment of ADIM

For the initial baseline measurement of the ADIM, 3 sets of measurements were taken, both at rest and during contraction of the TrA. Examiner 1 was blinded to group assignment and measured all of the muscle thickness values with the ultrasound machine. Examiner 2 administered instructions and biofeedback training, positioned the transducer to obtain an optimal image on the screen, and was blinded to the measurement values recorded. Prior to the first measurement, subjects were reminded to avoid the compensatory movements reviewed in the video.[4,16,27,28] For the resting measurement, the subject was instructed to relax and breathe normally, and the image was frozen at the end of an exhalation. Thickness measurements of the TrA and a combined EO and IO measurement were taken at this time. The subject was then given instructions for performing the ADIM, which were to "take a deep breath in, and when you exhale, pull your belly button in and up toward your spine and try to hold it for 10 seconds." The image was frozen during what appeared to be the maximal contraction, and thickness measurements were recorded. This was repeated 3 times. After baseline measurements were performed, Examiner 1 left the room while Examiner 2 administered the randomly assigned biofeedback method as part of the initial training session.

Feedback training session

Verbal feedback group

Subjects were asked to perform the ADIM while Examiner 2 monitored TrA activation using RUSI. The subject was not shown the RUSI screen. Subjects were only given verbal feedback in the form of "Yes, you are performing the contraction correctly. Please memorize what this feels like" or "No, you are not performing the contraction correctly. Please relax and try again."

Blood pressure cuff feedback group

The blood pressure cuff was laid flat, and the air chamber was placed under the lumbar spine while the subject was in the supine hooklying position. The cuff was inflated to 40 mmHg to fill the space between the table and spine.[4,16,28,29] The subject was instructed to watch the pressure gauge as instructions were given for correct performance of the ADIM. Examiner 2 explained that if the ADIM was performed correctly, the needle on the pressure gauge should not move, while if the ADIM was performed incorrectly and compensatory movements were detected, the needle would move. As would be the case in the clinical use of the blood pressure cuff, RUSI was not used to visualize the abdominal muscles during this feedback session. Subjects were given the same verbal feedback as the control group.

RUSI feedback group

The ultrasound screen was made visible to the subject while Examiner 2 identified the muscles on the screen. The examiner explained that if the ADIM was performed correctly the TrA would become thicker, and the other muscles (EO and IO) would remain relatively unchanged. The subject was then given instructions for performing the ADIM and received the same verbal feedback as the control group.

Immediate reassessment

After 5 minutes of practicing the ADIM with the randomly assigned biofeedback method, Examiner 1 returned to the room for the immediate reassessment of the ADIM. The same procedure for baseline measurements was followed, and a total of 3 alternating resting and contracting measurements were recorded.

Home exercise program and retention assessment

At the end of the initial testing session, all subjects were given instructions to perform a standardized home exercise program and asked to return two to 4 days later for follow up. For the home exercise program, subjects were asked to practice the ADIM each day and to record their progress in an exercise log until they returned. The ADIM was to be performed in the supine hooklying position 5 times, holding each contraction for 10 seconds, and this was to be performed at two different times throughout the day, for a total of 10 ADIM repetitions per day. When subjects returned for their follow up visit, the same testing procedures were followed as at baseline assessment. Home exercise logs were collected during the follow up visit.

Data Analysis

Reliability study

Initial pilot study data was analyzed to assess intrarater and interrater reliability between the two teams of examiners. Both intrarater and interrater reliability were calculated using an inter-image technique, which enabled analysis of each examiner's ability to consistently obtain and mark the correct on-screen image. Intraclass correlation coefficients (ICC) were calculated for resting and contracted TrA and EO+IO muscle thickness measurements assuming a 95% confidence interval. ICCs for interrater reliability were calculated using a Model 2 approach (2,3) and ICCs for intrarater reliability were calculated using a Model 3 approach (3,3).

Experimental study

Absolute muscle thickness measurements of the lateral abdominal wall during relaxed and contracted states were used to calculate 3 different outcome variables, as described by Teyhen et al[15]: contraction ratio (equation 1), EO+IO contraction ratio (equation 2), and the preferential activation ratio (equation 3).

Equation 1: TrA contraction ratio = $\frac{\text{TrA contracted}}{\text{TrA Rest}}$

Equation 2: EO + IO contraction ratio = $\frac{\text{EO + IO contracted}}{\text{EO + IO rest}}$

Equation 3: Preferential Activation Ratio = $\frac{\text{TrA contracted}}{\text{TrA + EO + IO contracted}}$ $\frac{\text{TrA rest}}{\text{TrA + EO + IO rest}}$

The TrA contraction ratio measures the relative change in the TrA muscle thickness during performance of the ADIM compared to its resting state. Similarly, the EO+IO contraction ratio measures the change in thickness of the EO+IO during contraction compared to their resting states. The preferential activation ratio demonstrates the ability to selectively activate the TrA in relation to total lateral abdominal wall muscle thickness. This was performed by calculating the ratios of TrA muscle thickness to total lateral abdominal wall muscle thickness for contracted and resting states, and then taking the difference between the two values. Higher ratios indicate that a greater proportion of the contraction could be attributed to the TrA, compared to the external and internal obliques, which is the

goal when performing the ADIM.

The mean and standard deviation were calculated for age, gender, and BMI, and a one-way analysis of variance (ANOVA), chi squared test, and Friedman test were used to make between-group comparisons, respectively. For the main study, Mauchley's test of sphericity was used to confirm that the 3 outcome variables approached a normal distribution that allowed for the use of parametric statistics. A Huynh-Feldt Epsilon correction was used for the EO+IO contraction ratio data set only, due to its violation of the assumption of sphericity. Three separate two-way repeated-measures ANOVAs were performed to describe between and within-subject effects for the 3 outcome variables. For each ANOVA, the 3 treatment groups (verbal feedback, blood pressure cuff biofeedback, and RUSI biofeedback) were compared across the 3 measurement times (pretraining, posttraining, and 2-4 days posttraining). Significance was set at $p < 0.05$. Post-hoc t-tests were performed to examine paired comparisons between time intervals. All statistical analyses were run using the Statistical Package for the Social Sciences (SPSS), Version 17.0.

RESULTS

Reliability Study

Intrarater ICCs for resting lateral abdominal wall muscle thickness (TrA and EO+IO) were 0.95 (95% CI: .90-.98) and 0.98 (95% CI: .95-.99) for team A, and 0.99 (95% CI: .99-1.00) for team B. Intrarater ICCs during muscle contraction were between 0.96 (95% CI: .92-.98) and 0.98 (95% CI: .96-.99) for team A and 0.96 (95% CI: .92-.98) and 0.97 (95% CI: .97-.99) for team B.

Interrater ICCs between team A and B for TrA and EO+IO muscle thicknesses during the resting phase were between 0.88 (95% CI: .69-.95) and 0.98 (95% CI: .96-.99), whereas during the contracted phase measures were between 0.92 (95% CI: .79-.97) and 0.98 (95% CI: .95-.99). All reliability results are reported in Table 1.

Table 1. Intrarater and Interrater Reliability. Values Represent Interimage Reliability Calculations Using Intraclass Correlation Coefficients (ICC) with 95% Confidence Intervals.

	Intrarater reliability (n=20)		Interrater reliability (n=20)
	Team A	Team B	
Resting TrA	0.95 (0.90-0.98)	0.99 (0.97-0.99)	0.88 (0.69-0.95)
Contracted TrA	0.96 (0.92-0.98)	0.96 (0.92-0.98)	0.92 (0.79-0.97)
Resting EO+IO	0.98 (0.95-0.99)	0.99 (0.99-1.00)	0.98 (0.96-0.99)
Contracted EO+IO	0.98 (0.96-0.99)	0.97 (0.94-0.99)	0.98 (0.95-0.99)

Abbreviations: TrA, transversus abdominis; EO, external oblique; IO, internal oblique

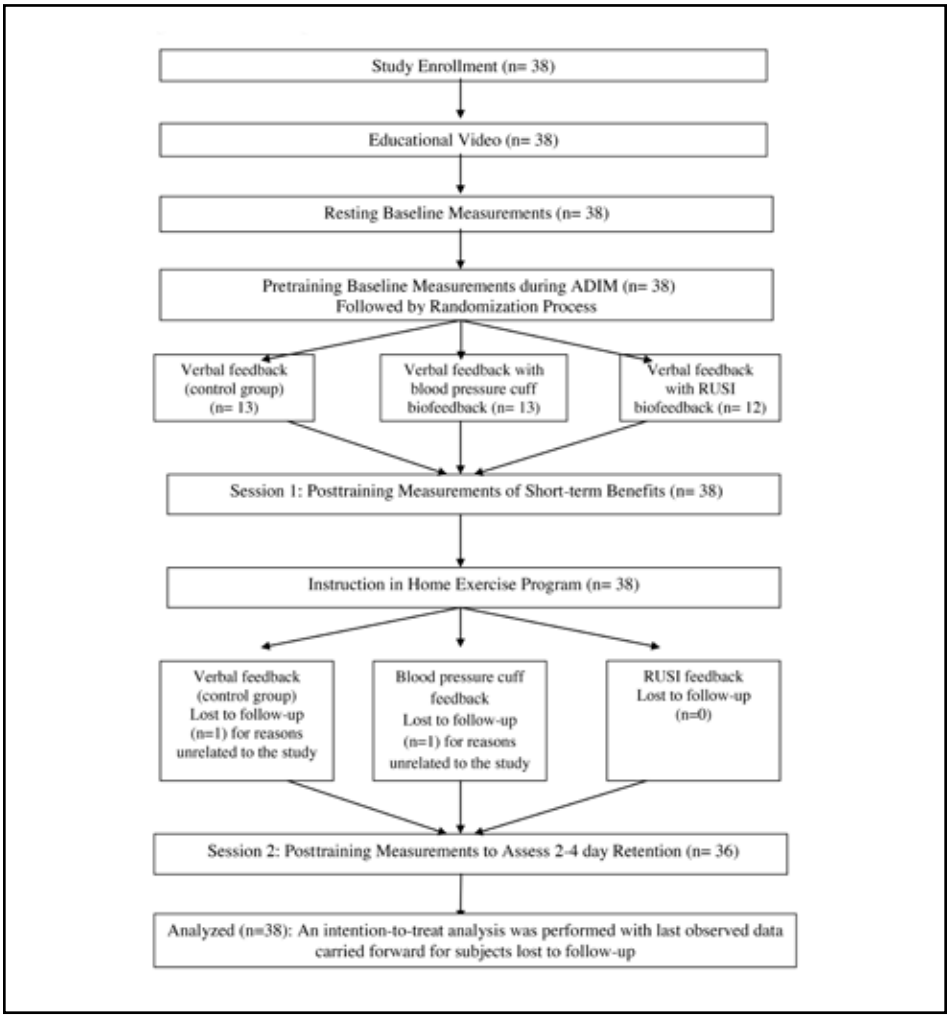


Figure 1. Consort diagram.

Experimental Study

Thirty-eight subjects met the inclusion and exclusion criteria and were enrolled in the study: 13 subjects in the verbal feedback group, 13 in the blood pressure cuff feedback group, and 12 in the RUSI feedback group. Thirty-six of 38 subjects completed follow-up testing. Two subjects were unable to complete the follow-up assessment for reasons unrelated to the study. One subject was from the verbal feedback group and the other from the blood pressure cuff group. An intention-to-treat analysis was performed to preserve the effects of randomization. Figure 1 shows a consort diagram of the subjects enrolled and their participation in the study. Between-group comparisons for age ($p = 0.32$), gender ($p = 0.97$), and BMI ($p = 0.18$) show statistical equivalence. Descriptive statistics are provided in Table 2.

Resting and contracted values for absolute muscle thickness of the TrA and EO+IO are reported for the 3 groups in Table 3. Table 4 shows mean contraction ratios (TrA and EO+IO) and preferential activation ratio data for all 3 groups, at all testing intervals. Mean TrA contraction ratios for all 3 groups show greater than a 1.5 fold increase in TrA thickness during the ADIM at all testing intervals, while mean EO+IO contraction ratios show only a 1.06 fold increase in the thickness of these muscles. Figure 2 shows mean ratio plots for the TrA and EO+IO contraction ratios.

Table 2. Descriptive Statistics

Description	Verbal Feedback (VF) (n=13)	VF + Biofeedback w/Blood Pressure Cuff (n=13)	VF + Biofeedback w/RUSI (n=12)
Age (y)	24.69 (5.39)	22.85 (4.08)	24.92 (6.71)
Height (cm)	171.75 (9.82)	166.45 (7.45)	166.78 (8.13)
Body mass (kg)	71.71 (11.02)	65.45 (8.19)	66.02 (11.18)
BMI (kg/m2)	24.31 (3.46)	23.65 (2.58)	22.93 (2.66)
Men-women ratio (n)	6:7	2:11	3:9

Data given as mean (standard deviation), unless otherwise noted.
Abbreviations: y, year; cm, centimeter; kg, kilogram; kg/m^2, kilogram/meters squared; n, number; BMI, body mass index

Table 3. Muscle Thickness of the TrA and EO+IO Measured Over Time

Time	Verbal Feedback (VF) (n=13)	VF + Biofeedback w/Blood Pressure Cuff Feedback (VF) (n=13)	VG + Biofeedback w/RUSI (n=12)	Overall (n=38)
TrA (cm)				
Baseline (rest)	0.39 (0.09)	0.40 (0.12)	0.37 (0.07)	0.39 (0.09)
Pretraining	0.60 (0.19)	0.63 (0.17)	0.58 (0.14)	0.60 (0.17)
Posttraining	0.64 (0.15)	0.64 (0.15)	0.63 (0.13)	0.63 (0.14)
2-4 days post	0.65 (0.10)	0.61 (0.17)	0.66 (0.15)	0.64 (0.14)
EO+IO (cm)				
Baseline (rest)	1.53 (0.36)	1.52 (0.44)	1.47 (0.28)	1.51 (0.36)
Pretraining	1.68 (0.36)	1.65 (0.51)	1.56 (0.29)	1.63 (0.39)
Posttraining	1.61 (0.37)	1.51 (0.38)	1.63 (0.29)	1.58 (0.35)
2-4 days post	1.66 (0.41)	1.58 (0.41)	1.55 (0.34)	1.60 (0.38)

Data given as mean (standard deviation).

Table 4. Contraction Ratios and Preferential Activation Ratio Data

Ratio/Time	Verbal Feedback (VF) (n=13)	VF + Biofeedback w/Blood Pressure Cuff Feedback (VF) (n=13)	VG + Biofeedback w/RUSI (n=12)	Overall (n=38)
TrA (cm)				
Pretraining	1.57 (0.33)	1.56 (0.29)	1.61 (0.25)	1.58 (0.29)
Posttraining	1.67 (0.27)	1.63 (0.28)	1.72 (0.15)	1.67 (0.24)
2-4 days post	1.68 (0.23)	1.62 (0.26)	1.67 (0.26)	1.66 (0.25)
EO+IO Contraction				
Pretraining	1.10 (0.11)	1.07 (0.14)	1.07 (0.07)	1.08 (0.11)
Posttraining	1.06 (0.09)	1.02 (0.06)	1.11 (0.14)	1.06 (0.11)
2-4 days post	1.09 (0.16)	1.04 (0.07)	1.06 (0.11)	1.06 (0.12)
Preferential Activation				
Pretraining	0.06 (0.04)	0.07 (0.04)	0.07 (0.03)	0.07 (0.04)
Posttraining	0.09 (0.04)	0.09 (0.03)	0.08 (0.02)	0.08 (0.03)
2-4 days post	0.08 (0.03)	0.08 (0.03)	0.09 (0.02)	0.08 (0.03)

Data given as mean (standard deviation).

The ANOVAs for each outcome variable were performed. The F statistics and significance levels are reported in Table 5 and Table 6. The ANOVA for TrA contraction ratios shows within-subjects effects to be statistically significant over time ($p = 0.043$), regardless of intervention group. Due to the observed significant effects of time for all groups, post-hoc t-tests were performed to look at paired comparisons between time intervals. There was a statistically significant difference between pretraining and posttraining values ($p = 0.027$). There was no significant difference between the two to 4 day follow-up and pretraining values ($p = 0.093$), nor between the two to 4 day follow-up and post-training values ($p = 0.562$). After applying a Bonferroni correction to counteract the inflated Type I error rate, there was no longer a significant difference between the pretraining and posttraining values. Between-subjects effects for TrA contraction ratios were not significant ($p = 0.748$). The TrA contraction ratio mean plots are shown in Figure 3. The ANOVA performed for EO+IO contraction ratios shows no significant differences for within or between-subjects effects.

The ANOVA for preferential activation of the TrA shows within-subjects effects to be statistically significant over time ($p = 0.006$), regardless of intervention group. Due to the observed significant effects of time for all groups, post-hoc t-tests were performed to look at paired comparisons between time intervals. This revealed a statistically significant difference between pretraining and posttraining values ($p = 0.005$), between pretraining and two to 4 day follow-up values ($p = 0.019$), but not between posttraining and two to 4 day follow-up values ($p = 0.634$). After applying a Bonferroni correction, there was no longer a significant difference between pretraining and two to 4 day follow-up values. However, there was still a significant difference between pretraining and posttraining values, even after applying the conservative Bonferroni correction. Between-subjects effects for preferential activation of the TrA were not statistically significant ($p = 0.992$). Preferential activation ratio mean plots are shown in Figure 4.

DISCUSSION

The preferential activation ratio demonstrates the ability to selectively activate the TrA in relation to total lateral abdominal wall muscle thickness. All 3 intervention groups showed a significant improvement

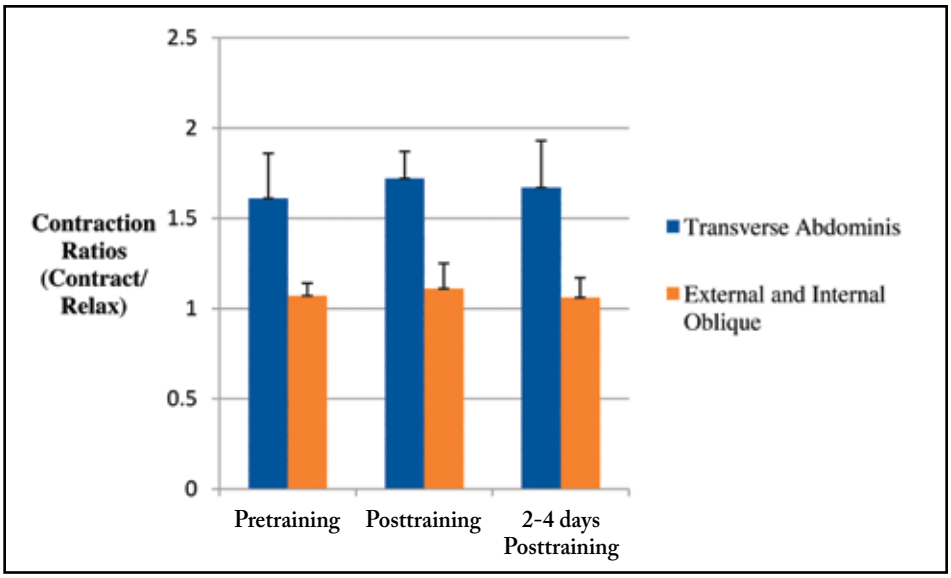


Figure 2. Contraction ratios.

Table 5. Statistics Calculated (F and p-values) for Within-subjects Effects Over Time

	TrA contraction ratio	EO+IO contraction ratio	Preferential activation ratio
Time	F= 3.287 p= 0.043	F= 0.384 p= 0.683	F= 5.579 p= 0.006
Time*Group	F= 0.154 p=0.960	F= 1.586 p= 0.188	F= 0.562 p= 0.691

Table 6. Statistics Calculated (F and p-values) for Between-subjects Effects

TrA contraction ratio	EO+IO contraction ratio	Preferential activation ratio
F= 0.292 p= 0.048	F= 0.742 p= 0.484	F= 0.008 p= 0.992

in the ability to preferentially activate the TrA from pretraining to posttraining. No significant differences were seen between groups. The TrA contraction ratio measures the relative change in the TrA muscle thickness during performance of the ADIM compared to its resting state. The ANOVA for TrA contraction was statistically significant at p = 0.043, which does not provide a lot of confidence concerning the type I error rate. Therefore it was not surprising that after applying the Bonferroni correction, none of the post-hoc t-tests were significant. Also no significant differences were seen between groups for the TrA contraction values. Contraction ratios for EO+IO show no significant difference within or between-groups, demonstrating that all intervention groups were able to perform the ADIM correctly at all testing intervals.

Results from the current study regarding subjects' ability to effectively demonstrate correct performance of the ADIM parallel the findings from Teyhen et al.[15] Results show that all 3 intervention groups were able to increase their TrA thickness greater than 1.5-fold during performance of the ADIM, as observed at pretraining, posttraining, and two to 4 days posttraining. This is in comparison to a two-fold increase in TrA thickness found by Teyhen and colleagues,[15] whose research was conducted using active military members with LBP who performed regular abdominal exercises. Because a 1.5-fold increase in TrA thickness was observed in the current study, which is less than the value reported by Teyhen et al,[15] it is possible that trained subjects are able to increase TrA thickness to a greater extent than subjects with limited abdominal training, regardless of the presence of LBP. Both studies revealed only a slight, nonsignificant increase in EO+IO contraction ratios for all intervention groups, across all time intervals. This shows that all subjects were able to perform the ADIM correctly.

This study was designed and conducted rigorously in order to assure credible results. A detailed description of the training undergone by both the investigators and subjects was provided in order to allow for reproducibility. Blinding was achieved by concealing the identity of the subjects' intervention group from Examiner 1 and by blinding Examiner 2 from all measurements obtained. In addition, the present study calculated both intrarater and interrater reliability, to ensure consistency within the individual teams and between both teams of examiners. These values were found to be in the good to excellent range. This study also assessed reliability using both resting and contracted measurements, which is important, as a contracted measurement is more difficult to obtain. The quality of the image and accuracy of the measurements are dependent on the skill level and training of the examiner; therefore, it is imperative to investigate the reliability of the examiners using both resting and contracted muscles.

Differences in learning preferences could have also played a role in the outcome of this study. Henry[13] states that when feedback is used, "the characteristics of the skill being learned and that of the learner also must be taken into account." Some individuals may have responded differently if they had received instruction via their ideal learning method. Koppenhaver et al[25] stated that many factors, "such as instructions from examiner, participant motivation, and the participant's skill at motor control" can all affect the learning and performance of a new skill. Results may have also been improved if there had been a varied rather than a constant feedback schedule. Past research has shown that retention of a new skill, such as activation of the lumbar multifidus, is better achieved when subjects practice with variable, delayed feedback as opposed to constant feedback.[30]

One possible limitation of the present study is the questionable reliability of the PBU as a measure of TrA activation. Although the PBU is used commonly in the clinic, the evidence for its use is mixed. Determining TrA activation by using the PBU may allow for several errors to occur, including positioning of the device and the subject, ensuring even distribution of air within the chambers, and giving a standardized verbal command for performing the ADIM.[17] A recent systematic review on the reproducibility of the PBU when measur-

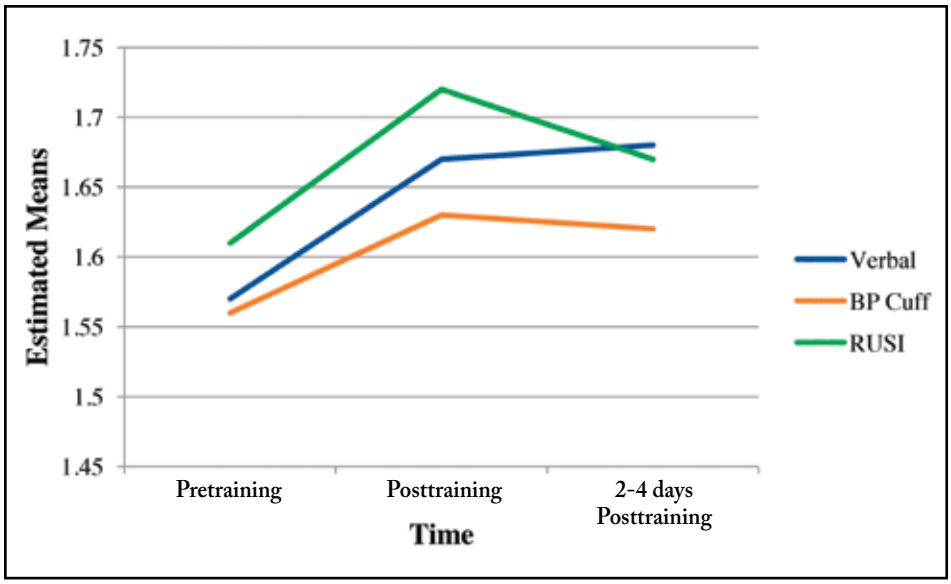


Figure 3. Transversus abdominis contraction ratio mean plots.

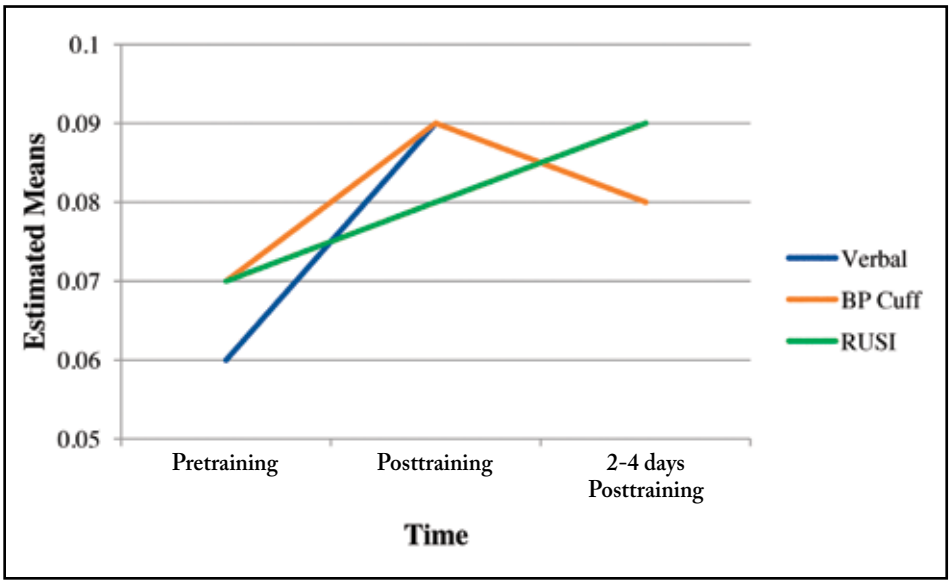


Figure 4. Preferential activation ratio mean plots.

ing TrA activity highlights the limitations in the existing studies.[17] The review discussed the lack of standardization in the protocol for the use of the PBU.[17] Several studies testing the reliability of the PBU in prone have found low reliability between and within raters.[18,19] Again, these studies show the lack of standardization in the use of a PBU, particularly in the prone position. To control for these limitations in our study, standardized instructions and positioning were given to each individual that received biofeedback with a blood pressure cuff. The supine hooklying position allows for training of the muscular corset action of the TrA more effectively and allows for excessive and unwanted spinal movements to be monitored.[16,29] It is also an easy position for most subjects to assume and maintain. An additional limitation of this study is the small sample size. Additional studies with a larger sample size may better detect whether a difference exists between the various forms of feedback.

The subjects in this study were asymptomatic; therefore, results cannot be generalized to a population with back pain. All groups in this study were able to demonstrate significant improvements in their ability to preferentially activate the TrA, regardless of intervention group. However, those with LBP may or may not respond to the varying forms of biofeedback in the same way. Several studies have found that individuals with LBP have deficits in the ability to contract the TrA. Keisel et al[8] found that there was a significant decrease in TrA and lumbar multifidus thickness during induced pain, while Hodges and Richardson[7] found that individuals with LBP had a delayed contraction of the TrA in response to upper limb movement when compared to matched controls with no back pain. The current study is in the process of being replicated with subjects who report LBP.

Endurance training of the core musculature as a treatment for LBP should be explored in future research as well. Many studies have reported the beneficial effects of specific activation of the TrA in those with LBP, but none have looked at the effects of a core endurance training program for retraining the TrA. The TrA is a stabilizer of the spine, and it should have adequate endurance in addition to strength in order to function properly during repeated or sustained limb and trunk movements to help prevent injury. For these reasons, it is possible that a training program more focused on endurance training of the TrA, as well as other deep core muscles such as the lumbar multifidus, could be advantageous for those with LBP.

Future studies with longer-term follow-ups are needed to determine if short-term improvements can be maintained longer than two to 4 days. Future researchers should also examine the effects of multiple feedback sessions to identify whether continued improvements in preferential activation of the TrA can be obtained. Some researchers have suggested that a variable feedback schedule rather than a constant feedback schedule (as used in this study) would yield more successful learning and retention of the skill.

CONCLUSION

Verbal feedback, biofeedback from a blood pressure cuff, and biofeedback from rehabilitative ultrasound imaging are all effective at teaching asymptomatic, untrained individuals to selectively activate the transversus abdominis using the ADIMNo biofeedback tool was statistically superior over another. While all 3 forms of feedback are viable tools for teaching a subject to selectively activate the TrA as part of a core stabilization program, verbal and blood pressure cuff feedback may be the most convenient and cost effective methods for administering a core stabilization program.

Both are quick and easy to administer, and blood pressure cuffs are commonly available in physical therapy clinics.

REFERENCES

1. Katz J. Lumbar disc disorders and low-back pain: socioeconomic factors and consequences. *J Bone Joint Surg*. 2006;88:21-24.
2. Deyo RA, Mirza SK, Martin BI. Back pain prevalence and visit rates: estimates from U.S. national surveys, 2002. *Spine*. 2006;31(23):2724-2727.
3. Critchley DJ, Coutts FJ. Abdominal muscle function in chronic low back pain patients: measurements with real-time ultrasound scanning. *Physiotherapy*. 2002;88(6):322-332.
4. Hides J, Stanton W, Freke M, Wilson S, McMahon S, Richardson C. MRI study of the size, symmetry, and function of the trunk muscles among elite cricketers with and without low back pain. *Br J Sports Med*. 2008;42:809-813.
5. Hides JA, Belavy DL, Cassar L, Williams M, Wilson SJ, Richardson CA. Altered response of the anterolateral abdominal muscles to simulated weight-bearing in subjects with low back pain. *Eur Spine J*. 2009;18:410-418.
6. Hides JA, Boughen CL, Stantan WR, Strudwick MW, Wilson SJ. A magnetic resonance imaging investigation of the transverse abdominal muscle during drawing-in of the abdominal wall in elite Australian football league players with and without low back pain. *J Orthop Sports Phys Ther*. 2010;10(1):4-10.
7. Hodges PW, Richardson CA. Inefficient muscular stabilization of the lumbar spine associated with low back pain: a motor control evaluation of the transverse abdominis. *Spine*. 1996;21(22):2640-2650.
8. Kiesel K, Uhl T, Underwood F, Nitz A. Rehabilitative ultrasound measurement of select trunk muscle activation during induced pain. *Man Ther*. 2008;13:132–138.
9. Hides J, Jull G, Richardson C. Long-term effects of specific stabilizing exercises for first-episode low back pain. *Spine*. 2001;26(11):243-248.
10. Teyhen D, Gill N, Whittaker J, Henry S, Hides J, Hodges P. Rehabilitative ultrasound imaging of the abdominal muscles. *J Orthop Sports Phys Ther*. 2007;37(8):450-466.
11. Teyhen DS, Rieger JL, Westrick RS, Miller AC, Molloy JM, Childs JD. Changes in deep abdominal muscle thickness during common trunk-strengthening exercises using ultrasound imaging. *J Orthop Sports Phys Ther*. 2008;38(10):596-605.
12. Drysdale CL, Earl JE, Hertel J. Surface electromyographic activity of the abdominal muscles during pelvic tilt and abdominal-hallowing exercises. *J Athl Train*. 2004;29(1):32-36.
13. Henry SM, Teyhen DS. Ultrasound imaging as a feedback tool in the rehabilitation of trunk muscle dysfunction for people with low back pain. *J Orthop Sports Phys Ther*. 2007;37(10):627-634.
14. Hides J, Wilson S, Stanton W, et al. An MRI investigation into the function of the transversus abdominis muscle during "Drawing-In" of the abdominal wall. *Spine*. 2006;31(6):175-178.
15. Teyhen D, Miltenberger C, Deiters H, et al. The use of ultrasound imaging of the abdominal drawing-in maneuver in subjects with low back pain. *J Orthop Sports Phys Ther*. 2005;35(6):346-354.
16. Chattanooga Group of Encore Medical, L.P. *Stabilizer Instruction Manual*. Austin, TX; 2005.
17. Olavo de Paula Lima P, Ribeiro de Oliveira R, Pena Costa L, Laurentino G. Measurement properties of the pressure biofeedback unit in the evaluation of transversus abdominis muscle activity: a systematic review. *Physiotherapy*. 2010;97:100-106.
18. Storheim K, Bo K, Pederstad O, Jahnsen R. Intra-tester reproducibility of pressure biofeedback in measurement of transversus abdominis function. *Physiother Res Int*. 2002;7(4):239-249.
19. Von Garnier K, Koveker K, Rackwitz B, et al. Reliability of a test measuring transversus abdominis muscle recruitment with a pressure biofeedback unit. *Physiotherapy*. 2009;95:8-14.
20. Glasoe W, Marquez R, Miller W, Placek A. Comparison of standard blood pressure cuff and a commercially available pressure biofeedback unit while performing prone lumbar stabilization exercise. *Orthop Practice*. 2005;17:26-28.
21. Herbert J, Koppenhaver S, Parent E, Fritz J. A systematic review of the reliability of rehabilitative ultrasound imaging for the quantitative assessment of the abdominal and lumbar trunk muscles. *Spine*. 2009;34(23):848-856.
22. Whittaker J, Teyhen D, Elliott J, et al. Rehabilitative ultrasound imaging: understanding the technology and its applications. *J Orthop Sports Phys Ther*. 2007;37(8):437-449.
23. Henry SM, Westervelt KC. The use of real-time ultrasound feedback in teaching abdominal hollowing exercises (AHE) to healthy subjects. *J Orthop Sports Phys Ther*. 2005;35:338-345.
24. Hides J, Richardson C, Jull G. Magnetic resonance imaging and ultrasonography of the lumbar multifidus muscle. *Spine*. 1995;20(1):54-58.
25. Koppenhaver S, Herbert J, Fritz J, Parent E, Teyhen D, Magel J. Reliability of rehabilitative ultrasound imaging of the transversus abdominis and lumbar multifidus muscles. *Arch Phys Med Rehabil*. 2009;90:87-94.
26. Vasseljen O, Dahl HH, Mork PJ, Torp HG. Muscle activity onset in the lumbar multifidus muscle recorded simultaneously by ultrasound imaging and intramuscular electromyography. *Clin Biomech*. 2006; 21:905-913.
27. Chon SC, Chang KY, You JH. Effect of the abdominal draw-in maneuver in combination with ankle dorsiflexion in strengthening the transverse abdominal muscle in healthy young adults: a preliminary, randomized controlled study. *Physiotherapy*. 2010;96:130-136.
28. Dutton M. *Orthopaedic Examination, Evaluation, and Intervention*. New York, New York: McGraw-Hill; 2004.
29. Manshadi F, Parnianpour M, Sarrafzadeh J, Azghani M, Kazemnejad A. Abdominal hollowing and lateral abdominal wall muscles' activity in both healthy men and women: an ultrasonic assessment in supine and standing positions. *J Body Mov Ther*. 2011;15:108-113.
30. Herbert W, Heiss D, Basso D. Influence of feedback schedule in motor performance and learning of a lumbar multifidus muscle task using rehabilitative ultrasound imaging: a randomized clinical trial. *Phys Ther*. 2008;88(2):261-269.

A Critical Analysis of Systematic Reviews Evaluating the Efficacy of Epidural Steroid Injections for Adults with Back and Leg Pain

John J. O'Sullivan, PT, DPT, OCS, ATC

Physical Therapist, Valley Medical Group, PC, Florence, MA

ABSTRACT

Background and Purpose: Lumbar epidural steroid injections (ESIs) are a common treatment for patients with low back and leg pain. Systematic reviews assessing the effectiveness of this intervention have reached conflicting conclusions. This review evaluates and clarifies the evidence for symptom and functional improvement for adult patients with back and leg pain having undergone epidural steroid injection. **Methods:** A literature review identified four current systematic reviews with conflicting conclusions. The AMSTAR and SUPPORT evaluation tools were utilized to assess the systematic reviews for quality and clinical relevance. **Findings:** ESI when performed for adults with low back and leg pain has fair evidence of a moderate short-term effect for pain relief. Studies with lower methodological scores reported greater short and long-term effects. **Clinical Relevance:** Clinicians need to examine systematic reviews for design flaws and potential bias.

Key Words: lumbar epidural steroid injection, low back pain, sciatica

INTRODUCTION

Epidural steroid injection (ESI) for treatment of back and leg pain is one of the most commonly performed interventions in the United States.[1] Medicare statistics have shown increasing utilization and cost of this technique.[2] However, as with many interventions for back and leg pain, increasing utilization and cost has not coincided with a reduction in the personal or societal costs of the problem. Many systematic reviews and clinical practice guidelines have made recommendations on the effectiveness of ESI. These recommendations have frequently been in conflict, with some claiming ESI to have positive short- and long-term effects for relief of back and leg pain[1,3-5] and others claiming no effect or modest short-term effects with ESI.[2,6-9]

Physical therapists are increasingly assuming primary care roles in the care of patients with musculoskeletal pain. In this role, physical therapists are called on to discuss the merits and harms of alternative treatments in the management of musculoskeletal conditions with patients and with other members of the primary care team.

Epidural injection can be carried out using various methods. Interlaminar injection is frequently carried out without fluoroscopic guidance. The benefit of this technique is delivery of infiltrate very close to the area of presumed interest. Caudal injection is also common and carried out without fluoroscopic guidance. The infiltrate is delivered through the sacral hiatus. The benefit to this technique is ease of performance and decreased likelihood of dural puncture. It is the least target specific and requires a large volume of infiltrate. Transforaminal injection is considered the most target specific of the approaches. It frequently uses fluoroscopic confirmation of needle placement. The most effective route for administering epidural steroids remains controversial.[4]

Epidural injection may use agents other than steroids. Some studies with active controls have used an anesthetic agent[10,11] or saline.[12,13] As seen in the outcomes of these studies, the necessity of steroid in the infiltrate is in question. Indications for ESI have not been clear and many studies have included highly heterogeneous populations including subjects with back and leg pain from presumed herniated nucleus pulposus, stenosis, post-lumbar laminectomy as well as those with axial pain.

The underlying mechanism of action for ESI is still not well understood. Conn et al[1] reviewed this in the introduction to their study. It is believed that the achieved neural blockade alters or interrupts nociceptive input, reflex mechanism of the afferent fibers, self-sustaining activity of the neurons and the pattern of central neuronal activities. Corticosteroids have been shown to reduce inflammation by inhibiting either the synthesis or release of a number of pro-inflammatory mediators and by causing a reversible local inflammatory effect.

Potential harm from ESI can be quite serious but is very rare. Chou et al[2] reviewed harms in their study and notes that while there have been case studies of paralysis and infections after ESI, serious adverse effects were rarely reported in trials. Reporting of harms was suboptimal in trials. Other authors[1] have reported complications of insomnia the night of the injection, transient non-positional headache, increased back pain, facial flushing, vasovagal reaction, nausea, and increased leg pain. The incidence of complications was 15.6% per injection.

Two systematic reviews and clinical practice guidelines have recommended against the use of epidural steroid injection based on the lack of clear benefit in randomized clinical trials.[6,7] In 2010 Manchikanti et al[3] published a response to the work of Chou et al.[2] The conclusion of the systematic review by Chou et al[2] was that ESI has a modest positive short-term effect, but no evidence of long-term effect. Manchikanti et al[3] claimed that this was erroneous based on a lack of objective analysis and undisclosed conflicts of interest. Specific criticisms of this systematic review and the resultant clinical practice guideline claimed that studies assessed are not reflective of current practice, evaluated a combination of multiple techniques that are not equivalent, have not used appropriate patient selection and have evaluated the evidence inappropriately or with bias.[3]

The following review has two objectives. First, to evaluate the evidence for symptom and functional improvement for adult patients with back and leg pain following epidural steroid injection. The second is to clarify why different conclusions about this technique have been presented in systematic reviews.

METHODS

A literature search was performed in PubMed and CINAHL on July 15, 2011. Key words used were low back pain, systematic review, and epidural steroid injections. Limitations were publications in the

last 5 years. Inclusion criteria consisted of systematic reviews that analyzed a subgroup of adults with back and leg pain due to presumed radiculopathy or radiculitis with epidural steroid injection. Only 4 studies have been used and selection criteria were based on using the most current reviews as well as reviews that offered differing recommendations.

The conclusions presented by a systematic review need to be evaluated for the same potential sources of design flaw and bias as is necessary in evaluating evidence from other types of study designs. Relevant reviews that transparently minimize bias can be used with greater confidence than those that do not. In order to evaluate these reviews for quality and for relevance to the clinical question, two tools have been used. The AMSTAR[14] tool was used to assess the methodological quality of systemic reviews and the grading for each study is outlined in Table 1. Better methodological quality can allow for greater confidence in accepting a review's conclusion. It is also necessary to evaluate the relevance of the conclusions to the clinical question at hand. SUPPORT tools,[15] which have been written for policy making, can be used to evaluate the confidence we can have in accepting the conclusions in a given scenario. The SUPPPORT confidence tool consists of 5 questions that can be applied to a review and is outlined in Table 2. The AMSTAR and SUPPORT confidence tools have considerable overlap in the criteria they consider. This review will report the overall AMSTAR score and discuss relevant factors highlighted by the SUPPORT confidence tool.

CRITICAL REVIEWS

Buenaventura R, Datta S, Abdi S, Smith H. Systematic review of therapeutic lumbar transforaminal epidural steroid injections. *Pain Physician*, 2009;12(1):233-251.

This is a systematic review of transforaminal epidural injection therapy for low back and lower extremity pain. A literature search of databases was conducted including PubMed and EMBASE from 1966 through November 2008, Cochrane database, clinical trial registry, systematic reviews, narrative reviews, and cross-references to these reviews published in the English language. The review focused on randomized trials, observational studies, and reports of complications. The population of interest was patients suffering with chronic low back and lower extremity pain for at least 3 months. No age range was given. Only studies evaluating lumbar transforaminal epidural injections with or without steroids were evaluated. Studies with evaluations of 6 months or longer and with statistical evaluations were included. Reports without appropriate diagnosis, nonsystematic reviews, book chapters, and case reports were excluded. Four randomized trials met the inclusion criteria and therefore no observational studies were used.

Methodological quality assessment used a modified, weighted Cochrane review criteria adapted from Koes and colleagues.[16] Clinical relevance was assessed according to 5 questions recommended by the Cochrane Back Review Group.[17] Level of evidence was classified as Level I, II, or III based on the quality of evidence presented by the US Preventive Services Task Force (USPSTF).[18]

One of the 4 studies evaluated was classified as being placebo controlled.[19] This study evaluated outcomes between subjects that received transforaminal epidural injections of methylprednisolone and bupivacaine and transforaminal epidural injection of saline. At two weeks, the steroid arm had significant improvement in leg pain, straight leg raising, lumbar flexion, and patient satisfaction. However, at 3 months the treatment effect was in favor of the saline group for reduced back pain and at 6 months the treatment effect was in favor of the saline group for reduced back and leg pain. At one year, 15 patients in the saline group and 18 in the steroid group went on for surgery. The remainders of the studies were active control. Jeong et al[20] evaluated the difference between ganglionic and preganglionic transforaminal epidural steroid injections. They found that a transforaminal epidural steroid injection for lumbosacral radiculopathy with a preganglionic approach is more effective than a ganglionic approach at short-term follow-up at one month. There was no difference in measured outcomes at 6 months. Measured outcomes were 50% reduction in visual analogue scale pain rating and improvement based on a 4-grade scale. Another study[21] assessed whether selective nerve root injections might help patients with lumbar radicular pain avoid spine surgery. Patients were randomized to receive either a selective nerve block injection of betamethasone with bupivacaine or with bupivacaine alone. The patients were followed up between 13 and 28 months and there was a significant difference in avoiding surgery in favor of the patients who received betamethasone and bupivacaine. The fourth study[22] compared epidural betamethasone to lumbar paraspinal muscle trigger points. Patients were randomized by their preference and there was no blinding in outcome assessment. This study reported significantly better outcomes for the epidural group with outcomes consisting of 50% reduction in the visual analogue scale and 5-point reduction in the Roland Morris disability questionnaire. However, short- and long-term follow-up was at random intervals.

The authors of this systematic review concluded that there is level ll-1 evidence (evidence obtained from well-designed controlled trials without randomization) for short-term relief. They also claim level ll-2 evidence (evidence obtained from well-designed cohort or case-control analytic studies preferably from more than one center or research group) for long-term relief in managing chronic low back pain and lower extremity pain with the use of transforaminal lumbar epidural steroid injections.

Caution should be exercised in accepting this conclusion. This systematic review scores 4/11 on the AMSTAR evaluation criteria. Duplicate study selection and data extraction were not described. Publication status and publication bias were not addressed. The excluded studies were not referenced and no conflict of interest was stated. The authors of the review used the outcomes of active control studies to erroneously provide evidence in support of transforaminal epidural steroid injection. They use the outcomes of the study by Jeong et al[20] to support short-term improvements in pain when this study will only allow a conclusion about the differential effect of ganglionic versus preganglionic transforaminal epidural steroid injection. They claim a positive short-term effect for transforaminal epidural steroid injection in the study by Karppinen et al[19] when that study clearly favors the saline injection arm at 3 and 6 months. It is difficult to make any judgment regarding pain in the study by Riew et al[21] as their outcome measure was whether subjects pursued surgery. This was not a stated outcome measure in this systematic review. While avoidance of surgery would clearly be a positive outcome, the decision to pursue or forego surgery is multifactorial. Without supportive data on symptoms or function, this study does not justify a conclusion of improved outcomes. This study performed in 2001 has yet to be reproduced and the study by Karppinen et al[19] does not demonstrate a difference in surgery for subjects receiving steroid injection. The authors claim level ll-2 evidence for long-term relief but the evidence, which

Table 1. AMSTAR a Measurement Tool Created to Assess the Methodological Quality of Systematic Reviews[10]

	Buenaventura (2009)	Chou (2009)	Conn (2009)	Luijesterburg (2007)
1. Was an 'a priori' design provided? The research question and inclusion criteria should be established before the conduct of the review.	Yes	Yes	Yes	Yes
2. Was there duplicate study selection and data extraction? There should be at least two independent data extractors and a consensus procedure for disagreements should be in place.	No	Yes	Yes	Yes
3. Was a comprehensive literature search performed? At least two electronic sources should be searched. The report must include years and databases used (eg, Central, EMBASE, and MEDLINE). Key words and/or MESH terms must be stated and where feasible the search strategy should be provided. All searches should be supplemented by consulting current contents, reviews, textbooks, specialized registers, or experts in the particular field of study, and by reviewing the references in the studies found.	Yes	Yes	Yes	Yes
4. Was the status of publication (ie, grey literature) used as an inclusion criterion? The authors should state that they searched for reports regardless of their publication type. The authors should state whether or not they excluded any reports (from the systematic review), based on their publication status, language etc.	No	No	No	Yes
5. Was a list of studies (included and excluded) provided? A list of included and excluded studies should be provided.	No	Yes	Yes	Yes
6. Were the characteristics of the included studies provided? In an aggregated form such as a table, data from the original studies should be provided on the participants, interventions and outcomes. The ranges of characteristics in all the studies analyzed, eg, age, race, sex, relevant socioeconomic data, disease status, duration, severity, or other diseases should be reported.	Yes	Yes	Yes	Yes
7. Was the scientific quality of the included studies assessed and documented? 'A priori' methods of assessment should be provided (eg, for effectiveness studies if the author(s) chose to include only randomized, double-blind, placebo controlled studies, or allocation concealment as inclusion criteria); for other types of studies alternative items will be relevant.	Yes	Yes	Yes	Yes
8. Was the scientific quality of the included studies used appropriately in formulating conclusions? The results of the methodological rigor and scientific quality should be considered in the analysis and the conclusions of the review, and explicitly stated in formulating recommendations.	No	Yes	No	Yes
9. Were the methods used to combine the findings of studies appropriate? For the pooled results, a test should be done to ensure the studies were combinable, to assess their homogeneity (ie, Chisquared test for homogeneity, I2). If heterogeneity exists a random effects model should be used and/or the clinical appropriateness of combining should be taken into consideration (i.e. is it sensible to combine?).	N/A	N/A	N/A	N/A
10. Was the likelihood of publication bias assessed? An assessment of publication bias should include a combination of graphical aids (eg, funnel plot, other available tests) and/or statistical tests (eg, Egger regression test).	No	No	No	Yes
11. Was the conflict of interest stated? Potential sources of support should be clearly acknowledged in both the systematic review and the included studies	No	Yes	No	Yes

Source: Shea BJ, Grimshaw JM, Wells GA, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC Medical Research Methodology*. 2007;7:10.

they provide, does not meet the criteria.

Chou R, Atlas S, Stanos S, Rosenquist R. (2009). Nonsurgical interventional therapies for low back pain: a review of the evidence for an American Pain Society clinical practice guideline. *Spine*. 2009;34(10):1078-1093.

Chou and colleagues[2] reviewed current evidence regarding the benefits and harms of nonsurgical interventional therapies of low back pain and radiculopathy, focusing on data from randomized controlled trials. It was part of a larger evidence review commissioned by the American Pain Society to guide recommendations for evaluation and management of low back pain.

A literature search was conducted through July 2008 in Medline, the Cochrane database of systematic reviews, and the Cochrane central register controlled trials. Electronic searches were supplemented by reference lists and additional citations suggested by experts. They did not include trials published only as conference extracts. Inclusion criteria included English language, or non-English-language

trial, but included in English-language systematic review and studies evaluating nonpregnant adults (greater than 18 years old) with low back pain of any duration, alone or with leg pain. Studies must have evaluated a target injection and reported at least one of the following outcomes: back specific function, generic health status, pain, work disability, or patient satisfaction. Exclusion criteria included trials of acute major trauma, cancer, infection, cauda equina syndrome, fibromyalgia, spondyloarthropathy, and osteoporosis or vertebral compression fracture. Two reviewers independently rated quality of trials using the 11 criteria developed by the Cochrane back review group.[17] Studies receiving scores of 6 or greater were considered higher quality. Joint review and the consensus process resolved discrepancies. Overall strength of evidence for a body of evidence used methods adapted from the USPSTF.[18] They evaluated consistency and defined inconsistency as greater than 25% of higher-quality trials reaching discordant conclusions.

Included were 40 randomized trials evaluating epidural steroid injections. Twenty-one trials (with two trials reported in one article) were placebo-controlled and 9 of the trials were rated higher quality. For low back pain with radiculopathy, they found inconsistent results for short-term (up to one month following injection) benefits, with 10 of 17 trials (including 3 of 7 higher-quality trials) showing no differences in pain or function between epidural steroid and placebo injections. The results were more consistent after trials were stratified according to whether the control intervention was an epidural or non-epidural (soft tissue) injection. Five of 6 trials found an epidural steroid injection associated with short-term benefits compared with a non-epidural placebo injection, including all 3 higher-quality trials. Four of 18 trials reported long-term (greater than three months) benefits following epidural steroid injection, but 3 of these were rated lower quality and did not report statistical significance of results. Three higher-quality systematic reviews reached discordant conclusions regarding short-term benefits following epidural injection for sciatica or radiculopathy. Two of these reviews[6,8] concluded that there was no difference between epidural steroids versus placebo for short-term pain relief. One of the reviews[5] concluded that epidural steroids were superior to placebo for "improvement in symptoms" for acute or chronic sciatica. Of the 21 placebo-controlled trials presented, 14 evaluated inter laminar injection, 4 evaluated caudal injections, and 3 evaluated transforaminal injection.

The authors concluded that they had found fair evidence (some inconsistency among higher-quality trials) that epidural steroid injection is moderately effective for short-term (but not long-term) symptom relief. They defined moderately effective as being a change of 10 to 20 points on a 100 point visual analogue scale, two to 5 points on the Roland Morris disability questionnaire, 10 to 20 point change on the Oswestry disability questionnaire or a standardized mean difference of .5 to .8.

This systematic review was conducted with methodological vigor and scored 8/11 on the AMSTAR. The authors excluded studies based on publication type and only included English language studies. The authors discussed their publication bias in terms of language restriction but not in terms of publication status. The conclusions of this systematic review can be accepted with confidence.

Conn A, Buenaventura R, Datta S, Abdi S, Diwan S. (2009). Systematic review of caudal epidural injections in the management of chronic low back pain. *Pain Physician*. 2009;12(1):109-135.

The purpose of the study by Conn et al[1] was to evaluate the effect of caudal epidural injections with or without steroids in managing various types of chronic low back and lower extremity pain emanating as a result of disk herniation or radiculitis, post lumbar-laminectomy syndrome, spinal stenosis, and chronic discogenic pain.

A literature search was conducted that included a search of databases including PUBMED and EMBASE from 1966 through November 2008, Cochrane database, Clinical Trial Registry, systematic reviews, narrative reviews, and cross-references to the reviews published in the English language. Selection criteria focused on randomized and observational studies, and reports of complications. The population of interest was patients suffering with chronic low back pain for at least 3 months. Only caudal epidural injections with or without

Table 2. SUPPORT Confidence Tool[11]

1. Did the review explicitly address an appropriate policy or management question? • Was the review question expressed explicitly and formulated clearly? • Was the review question formulated a priori? • Was question of relevance to policymaking or management? o Was the question too narrow? o Was the question too broad? o Did it specify an appropriate comparison group?
2. Were appropriate criteria used when considering studies for the review? • Did the review specify clear inclusion and exclusion criteria? • Are the inclusion and exclusion criteria explicit to the population, intervention and outcomes considered? • Are the inclusion and exclusion criteria congruent with the review question?
3. Was the search for relevant studies detailed and reasonably comprehensive? • Did a review describe in detail the strategy used to search for relevant studies? • Did the search strategy include electronic databases of published studies? • Were the searches of electronic databases supplemented by additional searching? • Are the searches up to date?
4. Were assessments of the studies relevance to the review topic and of their risk of bias reproducible? • Was an explicit and transparent approach used to assess the relevance of studies to the review topic? • Was an explicit and transparent approach used to assess the risk of bias in the included studies? • Were the results of the risk of bias assessment taken into account in interpreting the results of a review
5. Were the results similar from study to study? • If no, is there a compelling explanation for the differences that were found? • If a pooled estimate is made is this likely to be meaningful?
Source: Lewin S, Oxman AD, Lavis JN, Fretheim A. (2009). SUPPORT Tools for evidence-informed health Policymaking (STP) 8: Deciding how much confidence to place in a systematic review. *Health Research Policy And Systems/Biomed Central*.2009;7 Suppl 1:S8.

steroids were evaluated. All studies providing appropriate management outcome evaluations of 6x months or longer and statistical evaluations review were included.

Methodological quality assessment of randomized trials was performed using a modified Cochrane review criteria with weighted scores.[16] In evaluating interventions related to lower extremity pain as a result of disk herniation or radiculitis, the authors identified more than 4 randomized trials and therefore no observational studies were included for analysis. Clinical relevance was evaluated according to 5 questions recommended by the Cochrane Back Review Group. The level of evidence was classified as level I, II, or III based on the quality of evidence presented by the USPSTF.[18]

Ten randomized trials met inclusion criteria. Six of these studies evaluated disk herniation or radiculitis. Of the 6 randomized trials, the authors concluded 5e studies were positive for short-term relief and 4 studies were positive for long-term relief. The authors claim the evidence is level 1 (evidence obtained from at least one properly randomized controlled trial) for short and long-term relief in managing chronic low back and lower extremity pain secondary to lumbar disk herniation and/or radiculitis.

In the study by Manchikanti,[23] which is a preliminary, retrospective equivalence trial, the authors fail to recognize the lack of a control group and make claims about overall effectiveness when there was no statistically significant difference between groups. The authors claim long-term effectiveness in the study by Bush and Hillier[12] when there is no difference in pain relief and the only difference is in straight leg raise, an outcome which the review was not evaluating.

This study scores 6/11 on the AMSTAR instrument. The authors confine selection to English only studies and do not consider nonpublished or grey literature. They fail to address conflict of interest. The conclusions of this review are in question due to poor methodological quality and inappropriate interpretation of data in some studies based on study design.

Luijsterburg P, Verhagen A, Ostelo R, van Os T, Peul W, Koes B. Effectiveness of conservative treatments for the lumbosacral radicular syndrome: a systematic review. *European Spine Journal*. 2007;16(7):881-899.

The aim of this systematic review was to assess the effectiveness of conservative treatments in lumbosacral radicular syndrome (sciatica) when compared to placebo, inactive or no treatment, and other forms of conservative care or surgery.

Randomized clinical trials published in English, Dutch, French and German languages were included. Excluded were abstracts of which full reports were not available and unpublished studies. The authors used the search strategy recommended by the editorial board of the Cochrane Collaboration Back Review Group. Studies were searched for in PUBMED-MEDLINE (from 1966 to May 2004), EMBASE (from 1980 to May 2004), Cochrane Central Register of Controlled Trials, Cinahl (from 1982 to May 2004), PsycINFO (from 1984 to May 2004), and PEDro (to May 2004), and screening the references of all studies selected from the electronic databases searches and relevant reviews. Studies included patients with acute, subacute, or chronic lumbosacral radicular syndrome.

Data extraction by two reviewers was performed. Disagreements were resolved by discussion or with arbitration by a third reviewer. Quality of individual RCTs was assessed using the Delphi criteria. High quality was defined as a study with a positive score on 5 or more criteria. Clinical relevance was assessed using the Cochrane Collaborations Back Review Group recommendations. Qualitative analysis was reported using the Cochrane Collaboration Back Review Groups recommendation based on overall quality and outcome of studies.[17]

The authors identified 9 studies comparing epidural or extra dural corticosteroid injection to placebo injection. They considered short-term (3 months) and long-term (one year or greater) outcomes with measures of pain, overall improvement, return to work and disability. Six studies were considered high quality. In 3 high-quality studies and one low-quality study there was no difference in pain between injection and placebo at short-term follow-up. One high-quality and one low-quality study found an effect in pain at short-term, in favor of injection. For overall improvement in the short-term, 3 high-quality studies and one low-quality study found no difference between injection and placebo at short-term. One low-quality study found an effect in overall improvement, in favor of injection. Long-term effects for pain and overall improvement were not found in two high-quality studies and one low-quality study. No short- or long-term effects were found for disability and return to work in 3 high-quality studies.

The authors concluded, at long-term there is no evidence in favor of corticosteroid injections compared to placebo, no treatment or NSAID or anesthetic injection, with conflicting evidence for short-term pain relief.

The study was conducted with methodological vigor. This study scores 9/11 on the AMSTAR. The authors did not consider nonpublished or "grey" literature. They did discuss publication bias as well as language restriction. They failed to address conflict of interest. The primary limitations in this study are the fact that they combined studies of epidural and extradural interventions to reach their conclusion. This study is also the most dated of the 4 studies with the literature review including studies published until May 2004.

DISCUSSION

The 4 reviews evaluated here draw discordant conclusions regarding the short- and long-term effects of ESI on pain. Table 3 summarizes characteristics and conclusions of the studies. The studies with lower methodologic scores report greater effect in the short- and long-term. Some of the limitations found when trying to compare and reconcile these conclusions include disparate means of bias assessment for included studies, different conclusion drawn from the same studies, and a poor "a priori" definition of outcome measures. None of the systematic reviews were able to draw an evidence of effect on functional measures.

A significant source of variability in the reviews is found in their different method of quality assessment of individual randomized clinical trials. Both of the reviews by Buenaventura et al[4] and Conn et al[1] used a methodological assessment adapted by Koes and colleagues.[16] This assessment is weighted and any study scoring 50 out of 100 was included as a high quality study. The approaches used by Chou et al[2] and by Luijsterberg et al[8] graded studies and determined high and low quality based on an established cut off. This approach allows studies to be of high and low quality but requires greater rigor in study design for a study to be classified as high quality. An example of this is found in comparing Conn et al's[1] handling of the study by Mathews[10] that scored a 62 on their assessment, and was therefore considered a high quality study. Luijsterberg et al[8] graded the same study as 3/9 and it was not considered a high quality study. The importance of this is evident when recommendations are given based on

Table 3. Characteristics of Systematic Reviews

	Buenaventura	Chou	Conn	Luijsterburg
Population	Patients suffering with chronic low back and leg pain for at least 3 months	Non-pregnant adults (>18 years old) with low (lumbar or sacral) pain of any duration, alone or with leg pain	Patients suffering with chronic low back pain for at least 3 months	Patients with acute, sub acute or chronic lumbosacral radicular syndrome
Intervention	Transforaminal epidural steroid injection	Interlaminar, caudal, and transforaminal epidural steroid injections	Caudal epidural steroid injection	Epidural or extradural steroid injections
Outcomes	Primary: Pain relief (short term up to 6 months, long term >6 months. Secondary: functional and psychological status, return to work and reduction in opioid intake.	Back specific function, generic health status, pain, work disability or patient satisfaction	Primary: Pain relief (short term up to 6 months, long term >6 months. Secondary: functional and psychological status, return to work and reduction in opioid intake.	Symptoms, overall improvement, function and return to work
Studies	4 studies, one placebo controlled studies	21 placebo controlled trials	6 studies, 3 placebo controlled	14 studies, 9 placebo controlled
Quality of evidence assessment	Modified Cochrane Review with weighted scores	Cochrane Back Review Group Method	Modified Cochrane Review with weighted scores	Delphi List
Level of evidence	USPSTF (level I, II, III)	USPSTF (good, fair, poor)	USPSTF (level I, II, III)	Cochrane Back Review Group Method
Conclusions	Level II-1 for short term relief and Level II-2 for long term relief	Fair evidence that ESI is moderately effective for short (not long) term relief	Level 1 for short and long term relief	At long term there is no evidence of effect for EIS and conflicting evidence for short term pain relief
AMSTAR score	4/11	8/11	6/11	9/11

findings of high quality RCTs. The method employed by Buenaventura et al[4] and Conn et al[1] allowed studies with greater chance of bias to be included as high quality studies.

Using different levels of evidence scales is another source of variability. Three[1,2,4] of the four studies cite the same source[18] for their assessment of evidence scales. The USPSTF current methods presented in 2001 was written to describe the current methods of the third USPSTF. This paper described the hierarchical grading system (I, II-1, II-2, II-3, III) used by Buenaventura et al,[4] and Conn et al.[1] In the hierarchical system a grade of I is defined as evidence obtained from at least one properly randomized controlled trial. The third USPSTF contended the hierarchical system was limited due to the systems inadequate consideration of how well a study was conducted. The third USPSTF added a three category ranking (good, fair, poor) to address this shortcoming of the hierarchical system. This updated system utilized operational definitions for good, fair and poor for RCTs and cohort studies to be used in conjunction with the hierarchical system. Chou et al[2] adopted this updated system for their level of evidence scale using the good, fair, poor definitions. They defined good evidence as evidence that includes consistent results from well-designed, well-conducted studies in representative populations that directly assess effects on health outcomes (at least two consistent, higher-quality trials). Buenaventura et al[4] and Conn et al[1] used the hierarchical system but did not report on the updated three-category ranking. So, even while using the same source these studies adopted different methods of evidence assessment. Luijsterburg et al[8] used the Cochrane back reviews group[17] system that includes strong, moderate, limited, conflicting and no evidence. Strong evidence was defined as consistent findings in multiple high quality RCTs. Using the hierarchical system alone allows for assigning an evidence grade of I based on a single RCT without full assessment of the studies internal validity. The use of the three category ranking system or the Cochrane system requires more robust consideration of the evidence to achieve the highest ranking.

All of the reviews are limited by the quality and the heterogeneity of the studies that have been available for review. While the focus of this narrative review has been the potential application of ESI for adult patients with back and leg pain from presumed radicular pain, the inherent limitation in making this diagnosis and therefore performing adequate subject or patient selection remained.

The AMSTAR and SUPPORT tools were used to aid in the assessment of quality and relevance. Question 8 on the AMSTAR and question 4 on the SUPPORT tool specifically address the assessment of quality and relevance of the original studies to the review topic and conclusions. This required returning to the original studies and was an arduous process. This process is necessary in order to assess the validity and relevance of conclusions in the systematic review. This reviewer would argue that these two factor be given a higher weight in the tools.

Question 5 of the SUPPORT tool and question 9 of the AMSTAR address the similarity of conclusions as well as the methods used for combining findings. In the case of studies on lumbar ESI's the conclusions

are disparate and none of the 4 reviews attempted to combine findings in any form of meta-analysis.

CONCLUSION

The discordant conclusions of the various systematic reviews can be accounted for by a more lenient system of assessing for bias as well as level of evidence used by the lower quality reviews. This tendency has been noted in other studies of systematic reviews.[15] The criticisms that prior evaluation of trials was carried out with bias were not supported by this review. This review did not support the claim that there is evidence of superior outcomes when trials of transforaminal and caudal epidural steroid injections were carried out separately. If the current studies available for review are not reflective of current practice that is left to an individual to assess whether that limitation lies in research or in clinical practice. The best-supported statement of effect garnered from the evidence is that ESI when performed for adults with low back and leg pain has fair evidence of a moderate short-term effect for pain relief. No review supported improved function in the short- or long-term.

This is a case study in one clinician's method of assessing the evidence for epidural injection in adult patients with back and leg pain using the AMSTAR and SUPPORT tools. As a narrative review, caution should be used in accepting its conclusions.

The performance of the review highlights the need for clinicians to be aware of the various tools used for quality assessment as well as strength of evidence. Application of different tools to similar evidence may allow drawing disparate conclusions.

The goal of this process is to provide patients and clinicians with the evidence they need to make decisions about choosing an intervention. The heterogeneity of the conclusions from the studies cited can make this difficult. Future studies can help patients and clinicians by improving the reporting of harms, improving subject selection, randomization and blinding and using standardized functional measures. The development of studies that may identify positive predictor variables would also be helpful. As with all studies of back and leg pain, understanding the natural progression as measured through an appropriate control group can help improve the context of these long- and short-term effects.

REFERENCES

1. Conn A, Buenaventura RM, Datta S, Abdi S, Diwan S. Systematic review of caudal epidural injections in the management of chronic low back pain. *Pain Physician*. 2009;12(1):109-135.
2. Chou R, Atlas SJ, Stanos SP, Rosenquist RW. Nonsurgical interventional therapies for low back pain: a review of the evidence for an American Pain Society clinical practice guideline. *Spine*. 2009;34(10):1078-1093.
3. Manchikanti L, Datta S, Gupta S, et al. A critical review of the American Pain Society clinical practice guidelines for interventional techniques: part 2. Therapeutic interventions. *Pain Physician*. 2010;13(4):E215-E264.
4. Buenaventura RM, Datta S, Abdi S, Smith HS. Systematic review of therapeutic lumbar transforaminal epidural steroid injections. *Pain Physician*. 2009;12(1):233-251.
5. Vroomen PC, de Krom MC, Slofstra PD, Knottnerus JA. Conservative treatment of sciatica: a systematic review. *J Spinal Disord*. 2000;13(6):463-469.
6. Nelemans PJ, de Bie RA, de Vet HC, Sturmans F. Injection therapy for subacute and chronic benign low back pain. *Cochrane Database Syst Rev*. 2000(2):CD001824.
7. Staal JB, de Bie RA, de Vet HCW, Hildebrandt J, Nelemans P. Injection therapy for subacute and chronic low back pain: an updated Cochrane review. *Spine*. 2009;34(1):49-59.
8. Luijsterburg PAJ, Verhagen AP, Ostelo RWJG, van Os TAG, Peul WC, Koes BW. Effectiveness of conservative treatments for the lumbosacral radicular syndrome: a systematic review. *Eur Spine J*. 2007;16(7):881-899.
9. Paar A, Diwan S, Addi S. Lumbar Interlaminar Epidural Injections in Managing Chronic Low Back and Lower Extremity Pain: A Systematic Review. *Pain Physician*. 2009;12(1):163-188.
10. Mathews JA MS, Jenkins VM, Grimes SM, Morkel MJ, Mathews W, Scott CM, Sittampalam Y. Back pain and sciatica: controlled trials of manipulation, traction, sclerosant and epidural injections. *Br J Rheumatol*. 1987;26:416-423.
11. Riew KD, Park J-B, Cho Y-S, et al. Nerve root blocks in the treatment of lumbar radicular pain. A minimum five-year follow-up. *J Bone Joint Surg Am*. 2006;88(8):1722-1725.
12. Bush K, Hillier S. A controlled study of caudal epidural injections of triamcinolone plus procaine for the management of intractable sciatica. *Spine*. 1991;16(5):572-575.
13. Karppinen J, Ohinmaa A, Malmivaara A, et al. Cost effectiveness of periradicular infiltration for sciatica: subgroup analysis of a randomized controlled trial. *Spine*. 2001;26(23):2587-2595.
14. Shea BJ, Grimshaw JM, Wells GA, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC Med Res Methodol*. 2007;7:10-10.
15. Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP) 8: Deciding how much confidence to place in a systematic review. *Health Res Policy Syst*. 2009;7 Suppl 1:S8-S8.
16. Koes BW, Scholten RJ, Mens JM, Bouter LM. Efficacy of epidural steroid injections for low-back pain and sciatica: a systematic review of randomized clinical trials. *Pain*. 1995;63(3):279-288.
17. van Tulder M, Furlan A, Bombardier C, Bouter L. Updated method guidelines for systematic reviews in the cochrane collaboration back review group. *Spine*. 2003;28(12):1290-1299.
18. Harris RP, Helfand M, Woolf SH, et al. Current methods of the US Preventive Services Task Force: a review of the process. *Am J Prev Med*. 2001;20(3 Suppl):21-35.
19. Karppinen J, Malmivaara A, Kurunlahti M, et al. Periradicular infiltration for sciatica: a randomized controlled trial. *Spine*. 2001;26(9):1059-1067.
20. Jeong HS, Lee JW, Kim SH, Myung JS, Kim JH, Kang HS. Effectiveness of transforaminal epidural steroid injection by using a preganglionic approach: a prospective randomized controlled study. *Radiology*. 2007;245(2):584-590.
21. Riew KD, Yin Y, Gilula L, et al. The effect of nerve-root injections on the need for operative treatment of lumbar radicular pain. A prospective, randomized, controlled, double-blind study. *J Bone Joint Surg Am*. 2000;82-A(11):1589-1593.
22. Vad VB, Bhat AL, Lutz GE, Cammisa F. Transforaminal epidural steroid injections in lumbosacral radiculopathy: a prospective randomized study. *Spine*. 2002;27(1):11-16.
23. Manchikanti L, Singh V, Cash KA, Pampati V, Damron KS, Boswell MV. Preliminary results of a randomized, equivalence trial of fluoroscopic caudal epidural injections in managing chronic low back pain: Part 2--Disc herniation and radiculitis. *Pain Physician*. 2008;11(6):801-815.

The Role of Astym® Treatment in the Management of Lateral Epicondylosis: A Single-Case Research Design

Emily J. Slaven, PT, PhD, OCS, FAAOMPT[1]

[1]*Assistant Professor, Krannert School of Physical Therapy, University of Indianapolis, Indianapolis, IN*

ABSTRACT

Background and Purpose: Different treatment approaches are used to manage patients with lateral epicondylosis. **Methods:** Using an A-B-C-B-C, the effectiveness of Astym treatment was compared to a stretching and strengthening program in the case of a 48-year-old female presenting with lateral epicondylosis. Following phase A (baseline), a stretching and strengthening program was introduced in phase B. Phase C combined Astym with the stretching and strengthening program. Painfree grip strength (PFGS) and a Visual Analogue Scale (VAS) were used to assess change. Outcomes were analyzed with visual analysis and the two-standard deviation band. **Findings:** In phase C, visual analysis of the PFGS graph showed an upward trend, and the VAS graph displayed a downward trend. Using the two-standard band deviation method of analysis, 3 successive points in the second C phase fell outside of the band indicating statistically significant change. **Clinical Relevance/Conclusion:** These results suggest that Astym treatment was effective in managing this patient's lateral epicondylosis.

Key Words: tennis elbow, interventions, outcomes

INTRODUCTION

Lateral epicondylosis, also known as "tennis elbow," is a commonly managed musculoskeletal malady of the arm.[1] Lateral epicondylosis occurs not only in athletes but also in workers performing repetitive actions (ie, motions of factory line workers).[2] Occasionally, lateral epicondylosis can be caused by a single traumatic event that causes a strain of the extensor muscles of the forearm.[3]

Lateral epicondylosis is characterized by pain and sensitivity in the lateral region of the elbow.[2] Historically, tennis elbow has been considered to be an inflammatory condition and has often been referred to as lateral epicondylitis. The suffix "itis" indicates an inflammatory condition. However, recent histological studies have demonstrated that a noninflammatory condition is present in chronic cases of lateral epicondylitis, so the more appropriate terminology for cases of chronic lateral epicondylitis may be lateral epicondylosis, which indicates the underlying pathology of degeneration rather than inflammation.[4] In these cases of chronic lateral epicondylitis, degeneration and disorganization of collagen fibers and increased cellularity have been observed.[5,6]

There are many different conservative treatment approaches utilized in the management of a patient diagnosed with lateral epicondylosis.[7] These interventions include rest and modalities such as ice or laser, stretching, and strengthening.[2,8,9] However, these therapeutic techniques have been inconsistently effective in the treatment of lateral epicondylosis.[10] More invasive treatment options such as corticosteroid injections,[11] autologous blood injections,[9] and surgery[7] have been used to address recalcitrant cases of this condition. Cyriax[3] advocated the use of transverse friction massage in the treatment of lateral epicondylosis, and this treatment technique is used frequently in clinical practice today. Although there are a number of treatments used to treat lateral epicondylosis, few are scientifically based, and not one has become the treatment of choice.[12]

One treatment that focuses on the regeneration of soft tissues is Astym treatment. In contrast to cross transverse friction massage which is performed to mechanically alter the alignment of the fibres, Astym treatment focuses on activating a physiological response at a cellular level leading to the regeneration of soft tissues. Astym researchers have developed specific protocols and instrumentation to stimulate affected soft tissues to heal and regenerate at this cellular level. This outcome is achieved through a systematic process of strokes that are performed throughout the involved area, using hand-held instruments with a custom designed edge. As the instrumentation glides over the dysfunctional soft tissues, it "catches" on the irregular fibrosis, and the clinician and patient experience a sensation of roughness. The Astym process appears to activate a regenerative response through induction of leakage from dysfunctional capillaries, which leads to fibroblast activation, macrophage mediated phagocytosis (microdebridement), and local release of growth factors that result in additional fibroblast recruitment and activation.[13,14] Astym treatment was shown to provide favourable outcomes in a case report of a patient with lateral elbow pain.[15] Currently there have been no experimental studies published that explore the role of Astym in the management of patients with lateral epicondylosis. The purpose of this single-case research study was to investigate the effectiveness of Astym treatment in the management of a patient with lateral epicondylosis.

METHODS

Subject

The patient was a 48-year-old left handed Caucasian female who had an 8-week history of left lateral elbow pain (Figure 1). She related the onset of her pain to a single incident, throwing a large clump of earth over the garden fence. The day after throwing the clump of earth, the patient noticed pain in the elbow and this pain had progressively increased. Activities such as picking up a full coffee cup or a gallon of milk aggravated the elbow pain. The patient worked as an elementary school teacher and reported difficulty at times writing on the chalkboard.

When questioned about her general health, the patient denied any significant medical history. Prior to starting the study, an x-ray of the patient's left elbow revealed no bony anomalies that might interfere with conservative care of the condition. Prior to participating in the study, the patient had not undergone any medical treatment to the elbow.

Prior to the evaluation of the left elbow, the cervical spine and shoulder were examined to assess if these structures were contributing to the complaints in the left lateral elbow. While sitting the patient was

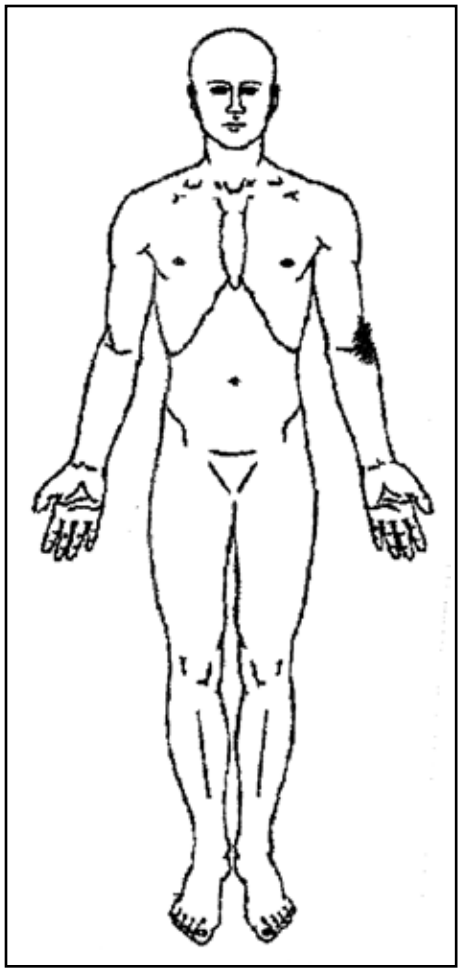


Figure 1. Body chart showing painful area.

instructed to perform active range of motion (AROM) of the cervical spine. If each cervical movement was painfree when actively performed, gentle end range pressure was applied by the physical therapist (PT) to assess the end feel of the motion. At this time the PT was also monitoring for referral of symptoms into the left upper extremity. As there was no production of left upper extremity symptoms with any of the cervical movements, the left shoulder was examined next. The left shoulder demonstrated full elevation as compared to the right shoulder and was clear with overpressure at end range of elevation. The cervical spine and shoulder were therefore eliminated as possible referral sources for the patient's lateral elbow pain.

On visual examination the left elbow displayed no visible signs of swelling, altered muscle bulk in the upper or lower arm, or discoloration. During the physical examination of the elbow, AROM of left elbow flexion and extension were found to be equal to the range of the right elbow. Passive flexion of the left elbow produced a painless soft end feel with soft tissue approximation. Passive extension of the left elbow produced an empty end feel with the patient complaining of pain at end range position. Active wrist flexion and extension was assessed both with the elbow flexed to 90° and extended to 0°. The patient reported no discomfort with end range wrist flexion and extension with the elbow flexed to 90°. However, the patient did report discomfort at the left elbow at end range active wrist flexion with the elbow extended to 0°.

Maudsley's test[16] was used to discern for extensor carpi radialis brevis involvement in the elbow dysfunction. A positive Maudsley's test was noted when the patient was unable to maintain the middle finger position against resistance because of pain.

Pain free grip strength (PFGS) was determined using the Jamar hand dynamometer (Tec Corp., model J000105, Clifton, NJ). Painfree grip strength is a common goal or clinical measure when determining functional abilities for patients with lateral epicondylosis.[17,18] Painfree grip strength on the right was 60 pounds of force; PFGS on the left was 8 pounds of force. This measurement was taken with the shoulder flexed to 90° and with the elbow fully extended. An average of 3 measures was taken for each limb with a 10 second rest between each measure.

The visual analogue scale (VAS) was used to capture the patient's pain rating. The VAS commonly takes the form of a 10 cm horizontal line that is anchored at each end, with the left side anchor representing the minimum score.[15] The VAS has been shown to be a reliable means to measure pain ratings over a period of time.[19] Using a VAS the patient rated her pain at rest at the 28 mm mark where 0 was no pain and 100 mm was the worst imaginable pain.

Following the examination the initial working diagnosis was lateral epicondylosis. As the patient had symptoms for greater than 6 weeks, the condition was considered to be chronic, and should be considered as a tendonosis since there are few inflammatory cells present in chronic conditions according to histological studies.[20] Therefore, the emphasis of treatment was aimed at improving the quality of the tissue rather than addressing inflammation.

Procedure

The single case study used an A-B-C-B-C format where A was the baseline phase, B the stretching and strengthening phase, and C was the phase that included Astym treatment with the stretching and strengthening regimen of phase B. This format of systematically introducing variables to observe an effect on a single case has been successfully used in other reported studies.[21-23]

Phase A: 6 visits without treatment (ie, the baseline phase)

The patient presented in the clinic every second day over a two-week period during phase A of the study. On each visit PFGS and VAS were recorded. By the end of the week two, it was evident from the data collected using the measurement tools that a stable baseline had been established.

Phase B: 6 visits of stretching and strengthening

Phase B began at the start of the third week. During this phase the patient performed 5 minutes of conditioning on the upper extremity ergometer prior to stretching and strengthening. Once the warm up was complete, the patient was instructed in a program of stretches for the wrist extensors and flexors. A progressive strengthening program where the patient strengthened the wrist flexors and extensors then followed the stretches. The stretches taught in the B phase of this study were to be performed at least 4 times a day, and each stretch was to be held in the stretch position for 45 seconds. The patient was seen twice a week for 3 weeks in phase B. Once the outcomes measures for phase B had stabilized, the patient was ready to begin phase C.

Phase C: 5 visits of Astym with the stretches and strengthening of phase B

In phase C the patient received the Astym treatment in conjunction with the stretching and progressive strengthening program of phase B. Treatment sessions began with the warm up on the upper extremity ergometer and the stretches from phase B. The patient was then seated with her left arm supported on a table. A lubricant (cocoa butter) was applied at this time to the forearm, elbow, and upper arm to reduce friction as the Astym instruments moved over the skin. The Astym instruments were passed along the palmar and dorsal aspects of the wrist, forearm, the lateral aspect of the epicondyle, and the biceps and the triceps (Figure 2). Treatment was also applied to the soft tissues of the upper extremity that work in conjunction with the extensors of the wrist in order to eliminate any fibrosis that may have developed through abnormal posturing and movement patterns. During phase

C, the patient received 5 treatment sessions over a 3-week period.

Second phases B and C: 6 visits of each phase

Following 3 weeks of the C phase, a second B phase was introduced. The treatment provided in this B phase mirrored the treatment that was provided in the first B phase. Five sessions of treatment were provided in this phase, and the second C phase was only commenced when the measurements recorded in the second B phase demonstrated a plateau. The final phase of this study was the second C phase. The patient received 5 treatment sessions of the Astym treatment in this phase. On the last visit, the patient had minimal complaints of left elbow pain.

Figure 2. Astym treatment to the upper extremity.

Data Analysis

The data from this study was analyzed by two separate mechanisms, Firstly visual analysis was performed where the level, variability, slope, and trend of the data points were examined (Worley and Harris, 1982). Statistical analyses using the two standard band method was then completed as a secondary method of analysis of the data.[24]

RESULTS

The results from the PFGS are displayed in Figure 3. Three measures of PFGS were taken at each time point of each phase. Visual analysis of the data shows an initial downward trend during phase A. Phase B consists of all consecutive data points being 0 where the patient experienced pain when she held the dynamometer and therefore could not generate any grip force. With the introduction of ASTYM treatment in phase C, the slope of the PFGS graph had an upward trend. This upward trend continued into the second B phase and then plateaued. An upward trend was seen again in the second C phase. Using the two standard deviation band method, it is noted that 3 successive data points in the second C phase fall outside the band signifying a statistically significant reduction in pain following implementation of the ASTYM treatment.

Pain was assessed using the VAS. Figure 4 displays the results. Analyzing the data visually, it can be seen that in the A and B phases the pain fluctuates. The decline in pain rating starts to occur in the first C phase and continues through the second B and C phases. Using the two standard deviation band method, there are noted to be 5 consecutive data points below the lower band indicating that a statistically significant change has occurred in the level of pain reported.

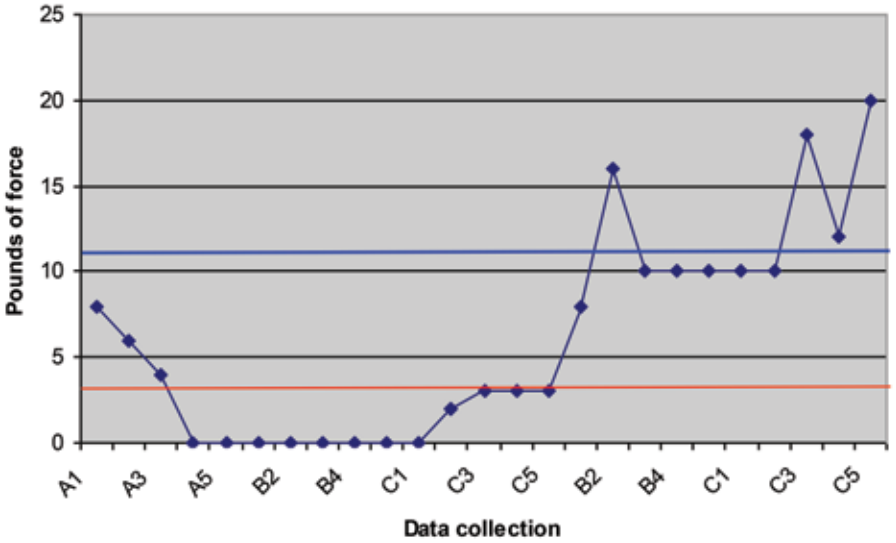
DISCUSSION

The results of this single case study suggest that Astym treatment in conjunction with a program of stretching and strengthening may be an effective treatment approach in the management of a patient with lateral epicondylosis. This study demonstrated an increase in PFGS and an overall decline in the pain reported with the introduction of Astym treatment.

The results from PFGS measurements were plotted on a graph where the data was interpreted both visually and statistically. With visual inspection of the data, it was noted that there was a decreasing trend in the data in phase A. It is possible that this decreasing trend was caused by the fact that the patient had not fully understood the instructions "squeeze until you feel pain," and it was not until the second to third baseline recording that the patient stopped applying pressure on the handle of the dynamometer when pain was felt. It is doubtful that the patient's condition improved during this phase, as the VAS data points do not indicate this. There is a gradual increasing trend in the first C phase. However, there are no data points in this phase that fell outside the 2 standard deviation band. In the first C phase of this study, the patient only had had 5 sessions with Astym treatment. It is possible the initial continued increasing trend in the second B phase is a result of the treatment given in the first C phase because after 3 sessions without the Astym treatment, the data points cease to increase. When Astym treatment was reintroduced in the second C phase, an increasing trend once again was observed. Three data points falling outside of the two standard deviation bands indicated that a statistically significant change had occurred.

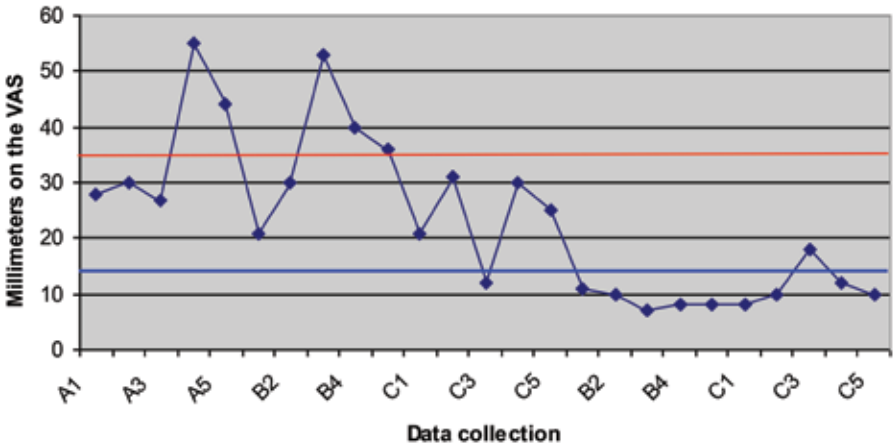
In the graph that recorded the VAS data, it is noted that there is an unclear trend in the data in phase A and the first B phase with both increasing and decreasing trends noted. It is not until the end of the first C phase that visually there was an obvious decelerating trend that continues through to the end of the second C phase. There is no evidence of statistically significant change in the pain level until the second B phase. At this time, a statistically significant change occurred. It is speculated that the first C phase caused the change but without continued application of the Astym intervention the data points in the second B phase plateaued out after two sessions with only stretching and strengthening. Using the two-standard deviation band method, a significant change in status is inferred if at least two successive or consecutive data points fall outside the 2 standard deviation range within the intervention phases.

Recent research into the treatment for lateral epicondylosis has focused on the use of approaches such as autologous blood injections,[9,25] shockwave therapy,[26,27] and laser.[8] When considering the use of manual therapy mechanism, the use of cross-friction massage has also been proposed as a treatment option for lateral epicondylosis. The results from a 2002 Cochrane review that examined the role of deep transverse fric-



Red line = Mean of the baseline
Blue line = Two standard deviation band above the mean

Figure 3. Painfree grip strength.



Red line = Mean of the baseline
Blue line = Two standard deviation band above the mean

Figure 4. Visual Analogue Scale.

tion massage (DTFM) in the treatment of tendinitis reported that DFTM combined with other physiotherapy modalities did not show consistent benefit over the control of pain, or improvement of grip strength and functional status for patients with lateral epicondylosis.[28]

At present a number of case reports have been published describing the effect of Astym treatment in the management of a variety of musculoskeletal conditions. There are no experimental studies in the literature that examine the effectiveness of Astym treatment as an option in the management of the patient with chronic lateral epicondylosis. It is proposed that with the introduction of Astym, the process and associated shear forces from the treatment provide a stimulus for the regenerative healing response allowing for reorganization at a cellular level.[14] This is combined with a program of stretching and strengthening to assist with fibre alignment. The onset of elbow pain for the patient in this study would fall into the category of a single traumatic event rather than a repetitive cause of onset. This may be a factor that would explain why the patient's pain was not abolished nor did PFGS return to normative values. Alternatively this patient may just have needed more treatment sessions to achieve these goals. In typical clinical settings, treatment sessions are sequential, and most patients receive between 8 and 10 sessions in the management of lateral epicondylosis.

There are several limitations that exist in this single-subject study. The therapist was not blinded to which phase of the study the patient was enrolled at each interval when taking the measurements. It could be argued that the therapist personally could not influence either measure as they were patient dependent. The patient obviously could not be blinded to the fact that they were receiving the Astym treatment, but they were unaware of the PFGS and VAS readings with each successive session and therefore could not deliberately affect the levels recorded.

As this is a single-subject study, the generalizability of the results to other patients with lateral epicondylosis is limited. Further studies are warranted to explore the efficacy and effectiveness of the Astym system in larger populations of patients with lateral epicondylosis.

ACKNOWLEDGEMENT

The Institutional Review Boards at Ball Memorial Hospital, Muncie, Indiana and the University of Manchester, England approved this study. This study was completed as part of the masters in physiotherapy from the University of Manchester, England.

This paper was presented at the APTA's Combined Section Meeting in February 2004

REFERENCES

1. Stasinopoulos D, Johnson M. Cyriax physiotherapy for tennis elbow/lateral epicondylitis. *Br J Sports Med*. 2004;38:675-677.
2. Trudel D, Duley J, Zastrow I, Kerr EW, Davidson R, MacDermid JC. Rehabilitation for patients with lateral epicondylitis: a systematic review. *J Hand Ther*. 2004;17:243-266.
3. Cyriax. The pathology and treatment of tennis elbow. *J Bone Joint Surg Br*. 1936;18:921-940.
4. Ashe MC, McCauley T, Khan KM. Tendinopathies in the upper extremity: a paradigm shift. *J Hand Ther*. 2004;17:329-334.
5. Andres BM, Murrell GA. Treatment of tendinopathy: what works, what does not, and what is on the horizon. *Clin Orthop Relat Res*. 2008;466:1539-1554.
6. Rees JD, Wilson AM, Wolman RL. Current concepts in the management of tendon disorders. *Rheumatology (Oxford)*. 2006;45:508-521.

7. Housner JA, Jacobson JA, Misko R. Sonographically guided percutaneous needle tenotomy for the treatment of chronic tendinosis. *J Ultrasound Med*. 2009;28:1187-1192.
8. Bjordal JM, Lopes-Martins RA, Joensen J, et al. A systematic review with procedural assessments and meta-analysis of low level laser therapy in lateral elbow tendinopathy (tennis elbow). *BMC Musculoskelet Disord*. 2008;9:75.
9. Edwards SG, Calandruccio JH. Autologous blood injections for refractory lateral epicondylitis. *J Hand Surg Am*. 2003;28:272-278.
10. Haller K, Helfst R, Wilson J, Sevier T. Treatment of chronic elbow pain. *Phys Ther Case Reports*. 1999;2:195-200.
11. Assendelft WJ, Hay EM, Adshead R, Bouter LM. Corticosteroid injections for lateral epicondylitis: a systematic overview. *Br J Gen Pract*. 1996;46:209-216.
12. Hong QN, Durand MJ, Loisel P. Treatment of lateral epicondylitis: where is the evidence? *Joint Bone Spine*. 2004;71:369-373.
13. Davidson CJ, Ganion LR, Gehlsen GM, Verhoestra B, Roepke JE, Sevier TL. Rat tendon morphologic and functional changes resulting from soft tissue mobilization. *Med Sci Sports Exerc*. 1997;29:313-319.
14. Gehlsen GM, Ganion LR, Helfst R. Fibroblast responses to variation in soft tissue mobilization pressure. *Med Sci Sports Exerc*. 1999;31:531-535.
15. Melham TJ. Atypical pneumonia in active patients: clues, causes, and return to play. *Phys Sportsmed*. 1997;25:43-59.
16. Fairbank SM, Corlett RJ. The role of the extensor digitorum communis muscle in lateral epicondylitis. *J Hand Surg Br*. 2002;27:405-409.
17. Smidt N, van der Windt DA, Assendelft WJ, et al. Interobserver reproducibility of the assessment of severity of complaints, grip strength, and pressure pain threshold in patients with lateral epicondylitis. *Arch Phys Med Rehabil*. 2002;83:1145-1150.
18. Stasinopoulos D, Stasinopoulos I, Pantelis M, Stasinopoulos K. Comparison of effects of a home exercise programme and a supervised exercise programme for the management of lateral elbow tendinopathy. *Br J Sports Med*. 2010;44:579-583.
19. Sim J, Waterfield J. Validity, reliability, and responsiveness in the assessment of pain. *Physiotherapy Theory and Practice*. 1997;3:23-37.
20. Nirschl RP. Elbow tendinosis/tennis elbow. *Clin Sports Med*. 1992;11:851-870.
21. Kazdan A. *Single-case research designs: Methods for clinical and applied settings*. New York, NY: Oxford University Press; 2010.
22. Ingram K, Lewis-Palmer T, Sugai G. Function-based intervention planning: Comparing the effectiveness of FBA function-based and non function-based intervention plans. *JPosit BehavInterv*. 2005;7:224-236.
23. Jason LA, Brackshaw E. Access to TV contingent on physical activity: effects on reducing TV-viewing and bodyweight. *J Behav Ther Exp Psychiatry*. 1999;30:145-151.
24. Portney L, Watkins L. *Foundations of Clinical Research. Applications to Practice*. 2nd ed. New Jersey: Prentice- Hall; 2000.
25. Mishra A, Pavelko T. Treatment of chronic elbow tendinosis with buffered platelet-rich plasma. *Am J Sports Med*. 2006;34:1774-1778.
26. Buchbinder R, Green SE, Youd JM, Assendelft WJ, Barnsley L, Smidt N. Systematic review of the efficacy and safety of shock wave therapy for lateral elbow pain. *J Rheumatol*. 2006;33:1351-1363.
27. Chung B, Wiley JP, Rose MS. Long-term effectiveness of extracorporeal shockwave therapy in the treatment of previously untreated lateral epicondylitis. *Clin J Sport Med*. 2005;15:305-312.
28. Brosseau L, Casmiro L, Milne S, Welch V, Shea B, Tugwell P, Wells G. Deep transverse friction massage for treating tendinitis. *Cochrane Database of Systematic Reviews 2002* Issue 4. Art No.: CD003528. DOI: 10.1002/14651858. CD003528.
29. Baker D, Wilson J. Bilateral Carpel Tunnel syndrome in a piano teacher. Physical Therapy Case Reports. *Phys TheraCase Reports*. 1999;2:73-76.
30. Henry P. Rehabilitation of post-surgical patellar fracture. *Physiotherapy*. 2000;86:139-142.
31. Melham TJ, Sevier TL, Malnofski MJ, Wilson JK, Helfst RH, Jr. Chronic ankle pain and fibrosis successfully treated with a new noninvasive augmented soft tissue mobilization technique (ASTM): a case report. *Med Sci Sports Exerc*. 1998;30:801-804.

Summary of the Neck Pain Pilot Project for the National Orthopaedic Physical Therapy Outcomes Database

James Irrgang, PT, PhD, ATC, FAPTA
Alexandra Gil, PT, PhD

INTRODUCTION

One of the objectives in the Orthopaedic Section Strategic Plan is to develop a National Orthopaedic Physical Therapy Outcomes Database (NOPTOD). The purpose of the outcomes database is to provide clinicians with a tool that they can use to assess their clinical performance. Additionally, information accumulated in the NOPTOD will be used to describe orthopaedic physical therapy practice and to provide evidence of the value of orthopaedic physical therapy. Ultimately, it is expected that the NOPTOD will be a repository for clinical and process outcomes data for the most common conditions treated by orthopaedic physical therapists.

As the first step in the development of the NOPTOD, the Orthopaedic Section conducted a 6-month pilot project to collect and analyze clinical and process outcomes data for patients with neck pain. The data collected during the pilot project were based on the ICF-based Neck Pain Clinical Practice Guidelines that were published by the Orthopaedic Section in the *Journal of Orthopaedic and Sports Physical Therapy*. The purpose of this pilot project was to demonstrate the feasibility of collecting and analyzing outcomes data as well as to determine the usefulness of the information to enhance clinician performance and to establish the value of orthopaedic physical therapy. The results of this pilot study will be used to plan and determine the resources needed for an electronic data capture and analysis system for the NOPTOD. The purpose of this article is to summarize the methods and results of the neck pain pilot project.

METHODS

Data Collection

A paper-based data collection form was developed for use of the neck pain pilot project. Baseline data that were collected included information related to the episode of care (duration of care, number of visits), patient characteristics (age, sex, height, weight, comorbidities), and history of the current episode of neck pain (onset date, mechanism of onset, recurrent condition, surgery). Symptoms and examination findings were recorded at baseline and weekly over the episode of care as were the treatment classification, interventions, and outcomes. No patient identifiers were recorded on the data collection form. A unique identification number was assigned to each patient and there no linkage list was maintained to link the identity of data from any patient.

The treatment classifications were based on the individual's symptoms and examination findings as described in the Neck Pain Clinical Practice Guidelines and included neck pain with mobility deficit, neck pain with headache, neck pain with movement coordination impairments, or neck pain with radiating pain. It was understood that a patient's treatment classification could change over time. Additionally, it was recognized that a patient may fit into more than one treatment classification; however, therapists were instructed to record only the primary classification that directed the intervention for that week.

Interventions were selected by the physical therapist based on their clinical decision making for each patient. Therapists were encouraged to apply the neck pain clinical practice guidelines in their clinical decision making. The intervention categories included cervical mobilization/manipulation, thoracic mobilization/manipulation, traction, coordination, strengthening and endurance exercise, stretching exercise, upper quarter nerve mobilization, patient education, and physical agents. Therapists were instructed to record the number of times each intervention was provided during each week of treatment.

The outcome measures included the Neck Disability Index and an 11-point numeric pain rating score. Outcome measures were collected at baseline, weekly during the episode of care, and at the end of care.

Recruitment and Training of Physical Therapists

An invitation to participate in the Neck Pain Pilot Project was distributed to Section members via Osteo-BLAST in February, March, and April 2012. Additionally an announcement regarding the project was made during the Orthopaedic Section Membership Meeting at the 2012 Combined Sections Meeting in Chicago, IL. Approximately 120 physical therapists expressed an interest in and registered to participate in the pilot project. Registration information for each physical therapist included practice setting, entry-level education, years of practice, advanced degrees, residency or fellowship training, and areas of specialization. Upon receipt of the registration form, the physical therapist was assigned a unique identification number. To protect the confidentiality of data from each therapist, the list linking the identity of the physical therapist to the identification number was maintained by the Executive Director of the Orthopaedic Section. No other individuals involved in the project could link the data to the physical therapist that submitted the data.

A Manual of Operations and Procedures was created that detailed all procedures for applying the neck pain clinical practice guidelines to collect and record data and procedures for submitting data to the Orthopaedic Section office. In April 2012 a webinar was held to train the physical therapists who volunteered to participate in the pilot project and to answer any questions.

Data Management and Analysis

The physical therapists were instructed to complete the case report forms prospectively during the episode of care. At the conclusion of care, the case report forms were forwarded to the Orthopaedic Section office. A data manager/analyst entered the data into an electronic database and the analyses were performed using IBM SPSS Statistics, version 20 (Chicago, IL).

Data analysis included calculation of descriptive statistics for all variables. This included frequency counts and percents for categorical variables and measures of central tendency (means, medians) and dispersion (standard deviations, ranges) for continuous variables.

The change in outcome scores from baseline to the end of care were calculated

in a manner in which positive scores indicated improvement in patient status. If an outcome score was not recorded at the end of care, the last weekly outcome score that was recorded was substituted for the value at the end of care. As a measure of value, the change in outcome score per visit was calculated. Additionally, the percent of patients that exceeded the minimum clinically important difference for the Neck Disability Index (9 points) and numerical pain rating scale (2 points) was determined.

The results were summarized for all patients that were included in the pilot project. To provide individual feedback to each physical therapist that participated in the pilot project, the results were summarized for each therapist as well. This provided each physical therapist a comparison of his/her individual performance to the performance of their peers.

RESULTS

Of the 120 physical therapists that registered to participate in the pilot project, 38 submitted completed case report forms for one or more patients with neck pain. In total, data describing the episode of care was submitted for 248 patients. The average age of the patients was 50 years with a range from 13 to 87. Sixty-four percent of the patients were female and the average body mass index was 27 kg/m^2. Forty-nine percent had one or more comorbidities. Hypertension was the most frequently reported comorbidity. Most commonly the onset of symptoms was gradual, followed by a sudden onset without trauma and then a traumatic/whiplash mechanism of onset. Forty-two percent received treatment for a recurrent condition and 9% were seen following surgery. Additional details of the patient characteristics are summarized in Table 1.

The process of care provided to patients that were included in this pilot project is summarized in Table 2. The average duration of care was 29 days with a range of 0 (only seen one visit) to 111 days. The average number of visits per episode of care was 6.4 with a range of 1 to 30 visits. The most frequent interventions that were provided to patients included in this pilot project were strengthening, coordination and endurance exercises (provided at least once during the episode of care to 89% of the patients), patient education/counseling (provided to 87% of the patients), cervical mobilization or manipulation (provided to 82% of the patients), and stretching exercises (provided to 75% of the patients). The least frequently used intervention was upper quarter nerve mobilization (provided to 20% of patients). Physical agents were provided to 58% of the patients and traction was used for 38% of the patients.

The outcome scores are summarized in Tables 3 and 4. Across all patients, the average (standard deviation) Neck Disability Index (NDI) scores were 31.1 (8.4) at baseline and 17.5 (15.6) at the end of care. The change in the NDI from the start to the end of care 13.5 (14.8) and the change score per visit was 2.7 (3.7). For the Numerical Pain Rating Score (NPRS), the averages at baseline and end of care were 4.8 (2.4) and 2.2 (2.3), respectively. The change in the NPRS

Table 1. Characteristics of Patients Included in Neck Pain Pilot Project for Anonymous Physical Therapist and All Physical Therapists that Participated in the Project

	Individual PT	All PTs
Age (yrs.)	31.8±9.7 (22;63)	50.4 ± 19.6 (13;87)
Height (inches)	69.1±4.8 (60;76)	66.6 ± 3.7 (54;76)
Weight (lbs.)	184.2±37.4 (120;235)	171.6 ± 39.3 (95;314)
BMI	26.9±3.9 (20.9;36.8)	27.1 ± 5.7 (18;57.4)
Female (%)	3 (18.8)	158 (63.7)
Ethnicity (%):		
- Hispanic or Latino	2 (12.5)	17 (6.9)
- Non-Hispanic or Latino	14 (87.5)	185 (74.6)
Race:		
- White/Caucasian	8 (50)	198 (79.8)
- Black/African American	4 (25)	26 (10.5)
- Asian	2 (12.5)	6 (2.4)
- *Other*	2 (12.5)	11 (4.4)
Comorbidities (%):		
- Diabetes	1 (6.3)	32 (12.9)
- Hypertension	4 (25)	73 (29.4)
- Cardiac Disease	0 (0)	18 (7.3)
- Smoking	6 (37.5)	37 (14.9)
Total # of Comorbidities (%):		
- None	11 (68.8)	114 (46.4)
- One o 3	3 (18.8)	102 (41.1)
- >3	1 (6.3)	20 (8.1)
Narcotics Use (%)	2 (12.5)	17 (6.9)
Steroid Use (%)	1 (6.3)	16 (6.5)
Onset Mechanism (%):		
- Gradual	5 (31.3)	109 (44.0)
- Sudden – No Trauma	8 (50)	72 (29.0)
- Traumatic/Whiplash	3 (18.8)	54 (21.8)
- Other	0 (0)	6 (2.4)
Recurrent Problem (%)	7 (43.8)	104 (41.9)
Surgery (%)	0 (0)	22 (8.9)
Insurance Type (%):		
- Commercial	0 (0)	143 (57.7)
- Medicare	0 (0)	43 (17.3)
- Medicaid	0 (0)	8 (3.2)
- Self-Pay	0 (0)	7 (2.8)
- Automobile	0 (0)	16 (6.5)
- Workers Compensation	0 (0)	8 (3.2)
- Other	16 (100)	17 (6.9)

Table 2. Process of Care Provided to Patients Included in Neck Pain Pilot Project for Anonymous Physical Therapist and All Physical Therapists that Participated in the Project

	Individual PT	All PTs
	Mean ± SD (Min ; Max)	Mean ± SD (Min ; Max)
Duration of Care (DOC) in days	25.9±20.6 (2;61)	29.4 ± 19.6 (0;111)
Number of Visits	3.2±1.9 (1;8)	6.4 ± 4.7 (1;30)
Density of Care	0.2±0.2 (0.02;1)	0.3 ± 0.1 (0.02; 1)
Interventions at any time over course of care (%):		
- Cervical Mob/Manip	14 (87.5)	205 (82.7)
- Thoracic Mob/Manip	15 (93.8)	163 (65.7)
- Traction	2 (12.5)	93 (37.5)
- Coord/Strength/Endur Ex.	16 (100)	220 (88.7)
- Stretching Exercises	15 (93.8)	186 (75.0)
- Upper Qt. Nerve Mob	3 (18.8)	49 (19.8)
- Patient Edu/Counseling	15 (93.8)	216 (87.1)
- Physical Agents	3 (18.8)	143 (57.7)

Table 3. Clinical Outcomes at Baseline and Discharge for Patients Included in Neck Pain Pilot Project for Anonymous Physical Therapist and All Physical Therapists that Participated in the Project

Clinical Outcome	Individual PT		All PTs	
	Mean ± SD (Min ; Max)		Mean ± SD (Min ; Max)	
	Baseline	DC	Baseline	DC
NDI (SD)	24.4±11.8 (8;44)	6.6±7.4 (0;20)	31.1±16.2 (1;98)	17.5±15.6 (0;74)
*NPRS (SD)	3.8±1.6 (1.7;7)	0.8±0.9 (0;3)	4.8±2.4 (0;10)	2.2±2.3 (0;10)
*NPRS values reported are the average of worst, current and best pain				

Table 4. Change in Clinical Outcomes and Change per Visit for Patients Included in Neck Pain Pilot Project for Anonymous Physical Therapist and All Physical Therapists that Participated in the Project

Clinical Outcome	Individual PT		All PTs	
	Change	Change/Visit	Change	Change/Visit
NDI (SD)	17.7±13.6 (-6;42)	6.0±3.9 (-2;13)	13.5±14.8 (-18;62)	2.7±3.7 (-4.0;23.0)
NPRS (SD)	3.0±1.7 (0.7;6.7)	1.1±0.6 (0.2;2.4)	2.6±2.7 (-4;10)	0.5±0.7 (-1.5;4.0)

was 2.6 (2.7) and the change per visit was 0.5 (0.07). The change in the NDI exceeded the minimum clinically important difference of 9% for 50% of the patients and 54% had a change in the NPRS that exceeded the MCID for the NPRS of 2 points (Table 5).

Interventions provided during the first week and over the course of care for patients that were classified as having neck pain with mobility deficit are summarized in Tables 6 and 7 and the outcomes of care for patients with neck pain with mobility deficit are summarized in Tables 8 and 9. Similar summaries were created for patients with neck pain with headache, neck pain with movement coordination impairments, or neck pain with radiating pain (data not shown).

The patient characteristics, process of care, and outcomes for each individual physical therapist was also summarized and provided to that physical therapist as feedback on their performance. This information for one anonymous physical therapist that submitted information on a total of 16 patients is provided in Tables 1 to 9. Review of the patient characteristics for this therapist's patients indicated that this therapist provided care to younger patients that were more likely to be males (Table 1). The duration of care was slightly shorter; however, this physical therapist provided 50% less visits during the course of care (Table 2). The magnitude of change in the NDI for this therapist was slightly greater than the magnitude of change obtained by all physical therapists [17.7 (13.6) vs. 13.5 (14.8)]; however because fewer visits were provided, the change in the NDI for this physical therapist was more than twice that of all therapists [6.0 (3.9) vs. 2.7 (3.7)] (Table 4). Almost 69% of this individual's patients had a change in the NDI score that exceeded the MCID for the NDI and 81% had a NPRS change score that exceeded the MCID for the NPRS (Table 5). Similar differences in outcomes between this therapist and all therapists were achieved for 8 patients that had a classification of neck pain with mobility deficits. In treating patients with neck pain with mobility deficits, if appears that this physical therapist made greater use of cervical and thoracic mobilization and manipulation and stretching exercises and less use of physical agents (Tables 6 and 7).

DISCUSSION

In his 2012 Mary McMillan Lecture, Alan Jette stated "Physical therapists must become equipped with the skills necessary to function within an effective health care system to identify what works, for what conditions, under what circumstances and at what costs." To achieve this, physical therapists must implement principles of evidence-based practice, design and populate clinical data sets and recognize and develop solutions uncovered by data (e.g., a quality improvement approach). The Orthopaedic Section National Orthopaedic Physical Therapy Outcomes Database is consistent with the vision expressed by Dr. Jette. The intent of the National Orthopaedic Physical Therapy Outcomes Database is to provide physical therapists with a tool that they can use to collect and analyze data that summarizes their clinical performance, which can

Table 5. Number of Patients Achieving a Clinically Meaningful Change for the Neck Disability Index (NDI) and Numerical Pain Rating Score (NPRS)

	Individual PT	All PTs
NDI Change > 9% (%)	11 (68.8)	125 (50.4)
NPRS Change >2 pts. (%)	13 (81.3)	134 (54.0)

Table 6. Treatment Provided During the First Week of Care for Patients with Neck Pain with Mobility Deficits for an Anonymous Physical Therapist and All Physical Therapists that Participated in the Project

	Individual PT	All PTs
Neck Pain with Mobility Deficit	Week 1	Week 1
- Cervical Mob/ Manip (%)	7 (87.5)	84 (72.4)
- Thoracic Mob/ Manip (%)	8 (100)	63 (54.3)
- Traction (%)	0 (0)	22 (19.0)
- Coord/Strength/Endur Ex. (%)	5 (62.5)	83 (71.6)
- Stretching Exercises (%)	7 (87.5)	84 (72.4)
- Upper Qt. Nerve Mob (%)	0 (0)	5 (4.3)
- Patient Edu/Counseling (%)	7 (87.5)	95 (81.9)
- Physical Agents (%)	1 (12.5)	49 (42.2)

Table 7. Treatment Provided Over the Course of Care for Patients with Neck Pain with Mobility Deficits for an Anonymous Physical Therapist and All Physical Therapists that Participated in the Project

Neck Pain with Mobility Deficit	Individual PT	All PTs
- Cervical Mob/ Manip (%)	8 (100)	102 (87.9)
- Thoracic Mob/ Manip (%)	8 (100)	83 (71.6)
- Traction (%)	0 (0)	33 (28.4)
- Coord/Strength/Endur Ex. (%)	8 (100)	106 (91.4)
- Stretching Exercises (%)	8 (100)	93 (80.2)
- Upper Qt. Nerve Mob (%)	1 (12.5)	16 (13.8)
- Patient Edu/Counseling (%)	7 (87.5)	100 (86.2)
- Physical Agents (%)	2 (25)	64 (55.2)

be used by the therapist to create a plan to enhance their clinical practice.

The results of the Neck Pain Pilot project demonstrated that collection of process and outcomes data summarizing the episode of care provided by physical therapists to individual patients is feasible. However the project also indicated that improvements with the quality of data could be made with development of a web-based data collection form. In reviewing, coding and inputting the data, it became apparent that there was some confusion on how some variables should be measured and recorded. For example, there was confusion on how to record the Numerical Pain Rating Scale scores. The instructions indicated that pain should be rated on a 0 to 10 point numerical rating scale and three values should be recorded (current, best and worst within past 24 hours). However, in reviewing the data collection forms, there was a great deal of variability in how the pain data were recorded. Some recorded only a single value and some recorded pain on a 0 to 100 point scale. An electronic data collection platform could eliminate this confusion by allowing separate fields for the current, best and least pain and also provide range checks to prevent entering values that are out of range.

Future development of an electronic format for data collection should allow for individual physical therapists to manually key in their data through a secure web-based platform. Additionally, if the data are already captured in the electronic medical record, methods to electronically migrate data from the medical record to the outcomes database should be explored.

The process of outcomes data collection is only valuable to those that collected the data if summaries of the data are available in real time. This should include reports that summarize the process of care and outcomes for individual patients that could be used for reporting purposes. Additionally, the system should allow physical therapists to generate standardized reports on demand that summarize their performance for groups (for example, all patients with neck pain within a specified date range) or subgroups of patients (for example, all patients in a specific classification such as neck pain with mobility impairments) and allow for comparison to their peers (ie, for benchmarking purposes).

Future development of the National Orthopaedic Physical Therapy Outcomes Database also includes plans for expansion to include collection of data for other regions of impairment including low back, shoulder and knee. To ensure consistency, each component of the outcomes database will be based on ICF model of functioning and disability as well as applicable clinical practice guidelines published by the Orthopaedic Section.

The American Physical Therapy Association has also indicated that it is interested in developing an outcomes registry. To avoid duplicative efforts and to take advantages of the expertise of the Section related to assessment of orthopaedic outcomes and the resources of the APTA, the Section will explore the possibility of working collaboratively with the APTA to more rapidly

Table 8. Clinical Outcomes at Baseline and Discharge for Patients with Neck Pain with Mobility Deficits for Anonymous Physical Therapist and All Physical Therapists that Participated in the Project

Neck Pain with Mobility Deficit	Individual PT		All PTs	
	Baseline	DC	Baseline	DC
NDI (SD)	26±12.2 (8;42)	3.0±4.5 (0;12)	29.9±17.1 (1;98)	16.5±15.8 (0;74)
NPRS (SD)	4.1±2.0 (1.7;7)	0.6±0.7 (0;2)	4.5±2.4 (0;10)	2.0±2.2 (0;8.7)

Table 9. Change in Clinical Outcomes and Change per Visit for Patients with Neck Pain with Mobility Deficits for Anonymous Physical Therapist and All Physical Therapists that Participated in the Project

Neck Pain with Mobility Deficit	Individual PT		All PTs	
	Change	Change/Visit	Change	Change/Visit
NDI (SD)	23±12.1 (8;42)	8.1±3.9 (2.6;13)	13.3±15.1 (-18;62)	2.6±3.6 (-4;14)
NPRS (SD)	3.4±1.9 (1.7;6.7)	1.1±0.3 (0.6;1.7)	2.4±2.5 (-2;10)	0.5±0.5 (-0.67;2.0)

develop and expand the efforts to create the National Orth0paedic Physical Therapy Outcomes Database.

Ultimately, it is envisioned that the National Orthopaedic Physical Therapy Outcomes Database will provide physical therapists with a tool that will enable them to be reflective practitioners that are well poised for practice in today's challenging healthcare system and into the future.

Book Reviews

Michael J. Wooden, PT, MS, OCS
Book Review Editor

Book reviews are coordinated in collaboration with Doody Enterprises, Inc.

Therapeutic Exercise for Physical Therapist Assistants, 3rd Edition, Lippincott Williams & Wilkins, 2013, $75.99
ISBN: 9781608314201, 538 pages, Soft Cover

Editors: Bandy, William D., PT, PhD, SCS, ATC; Sanders, Barbara, PT, PhD, SCS, FAPTA

Description: This reference on physical therapy interventional techniques for both student and practicing physical therapist assistants includes practice test questions, case studies, and perspectives on interventions for geriatric and pediatric populations. An online supplement includes the full text with keyword search, PowerPoint presentations, additional images, and videos. There are also online resources for educators, including a test generator and additional therapeutic exercise videos. This update of the 2007 edition is warranted in light of the evolving responsibilities of the PTA as well as advances in research. **Purpose:** The purpose is to provide clinical indications for and detailed descriptions of interventions performed by a physical therapist assistant (PTA). There are no other therapeutic exercise books written specifically for the PTA and this one does a good job of describing interventions frequently delegated to the PTA. **Audience:** The book is intended for students, PTA educators, and PTA professionals. It provides a good foundation for students learning therapeutic exercise as well as resources for practicing clinicians. **Features:** Six of the book's seven parts focus on interventional techniques, including mobility, strength and power, balance, cardiopulmonary applications, functional progression in therapeutic exercise, and unique applications of therapeutic exercise. The pictures of exercises and interventions featured throughout the book are large, clear, and well described. New to this edition is information on joint mobilization, therapeutic exercise for the preparation of gait activities, and application of therapeutic exercise using sample protocols. However, the joint mobilization chapter is inadequate, lacking information on the concepts of open versus closed-pack positions, treatment planes, and contraindications. The pictures of specific joint mobilizations are large enough, although they could be improved by clarifying the direction of force. **Assessment:** The updates in this edition are necessary, given the evolving responsibilities of the PTA and the latest research. Overall, this is a helpful book, particularly for student PTAs, but also as a reference for practicing PTAs.

Monique Serpas, DPT
HealthReach Rehabilitation Services

ACSM's Exercise for Older Adults, Lippincott Williams & Wilkins, 2014, $42.95
ISBN: 9781609136475, 236 pages, Soft Cover

Editor: Chodzko-Zajko, Wojtek J., PhD

Description: Despite the evidence about the benefits of physical activity for midlife and older persons, there has been little success in convincing people in this age group to adopt a physically active lifestyle. This book seeks to identify some of the barriers faced by older adults when they attempt to increase physical activity, and to outline specific strategies for helping them overcome these barriers. It offers practical strategies for the integration of various physical activities to create a healthier, more active lifestyle. **Purpose:** The purpose is to teach exercise professionals about the many reasons why older adults should engage in regular physical activity by summarizing the physiological, psychological, social, and other benefits that accrue to them when they maintain a physically active lifestyle. The book clearly meets these objectives and provides exercise specialists useful information in a clear and effective way. **Audience:** The audience is exercise professionals working with healthy and special needs older clients in a variety of settings. The author is a professor, researcher and head of the Department of Kinesiology and Community Health at the University of Illinois at Urbana-Champaign. The contributors are professors and researchers in similar departments from universities across the U.S. **Features:** Each of the 10 well organized chapters is written by qualified researchers and begins with a chapter outline and introduction. The chapters are geared to assist exercise professionals in understanding the process of human aging and the benefits of exercise and an active lifestyle. They include tables, key point boxes, and real-life stories, and end with a summary, questions for reflection, and a bibliography for reference. The middle chapters of the book offer detailed and well presented information based on ACSM guidelines for physical activity options for healthy and special needs adults, and the assessment of physical activity and fitness in older adults. The book concludes with chapters covering nutritional guidelines to assist in maintaining health, and guides to assisting in the selection of an appropriate exercise program. The book includes supplemental materials: an appendix covering ACSM and AHA physical activity recommendations for older adults and web access to PowerPoint lecture outlines for teaching, along with access to the full text, including all tables. The book is well organized from beginning to end and is sufficiently detailed for students and exercise specialists alike. The material is well referenced with up-to-date bibliographies. **Assessment:** This is an excellent book with enough detail to be used by students in the classroom and by exercise specialists as a reference in clinic, wellness, and community health program settings.

William Martinez, PT, OCS, FAAOMPT
Alves & Martinez Physical Therapy & Athletic Performance

Outcome-Based Massage: Putting Evidence into Practice, 3rd Edition, Lippincott Williams & Wilkins, 2014, $64.99
ISBN: 9781451130331, 520 pages, Soft Cover

Editor: Andrade, Carla-Krystin, PhD, PT

Description: Written by a multidisciplinary team, this book is designed to show students and practitioners how to integrate outcome-based massage into daily practice. This edition draws input from a team of massage therapists, physical therapists, and physicians to introduce a broader view of how to use outcome-based massage in clinical practice. The previous edition was published in 2008. **Purpose:** The purpose is to provide students and practitioners with the tools to address the unique needs and desired outcomes of each individual, using current evidence, with the goal of increasing client satisfaction and treatment effectiveness. Using evidence to promote best practice, this is a much-needed contribution to the field. **Audience:** The book is written for healthcare students and professionals whose scope of practice permits them to perform massage techniques. It is geared towards entry level students or practitioners who have not yet incorporated evidence into their practice. **Features:** The book is divided into two parts, one on the principles of outcome-based massage and one on the application of outcome-based massage to clinical conditions and wellness. The chapters cover principles, ethical issues, evidence, examination scheme, clinical decision making, positioning, sequencing of massage techniques, and application to clinical conditions. Various graphs and tables help illustrate main points and clinical cases end each chapter. Bolded text draws attention to keywords and ideas, and black-and-white photos clearly illustrate techniques. Each chapter has a section of highlighted takeaway points and critical thinking questions for review. A color, quick-treatment guide for various conditions, such as adhesive capsulitis, ankle sprain, piriformis syndrome, tension headaches, and stiff neck, appears at the end of the book. This guide includes a description of the condition, relevant examination techniques, impairments, contraindications, and relevant outcomes, and massage techniques. Because the book contains so much information, readers may find it difficult to quickly and easily find what they need. **Assessment:** This is an excellent book on massage techniques. It is well organized and color coded with thoughtful questions for critical thinking. It is written for entry level students, primarily in the field of massage therapy, but it can be used by physical therapy practitioners looking to improve or learn massage techniques to complement their interventions. A well-written section on friction massage will be particularly helpful to therapists. This needed update describes how to apply the evidence to massage therapy techniques clinically.

Amisha Klawonn, PT, DPT
A. T. Still University

Finance Committee Report

Steven R. Clark, Chairman

The Finance Committee met August 2013 to review financial operations and to make recommendations for the 2014 budget. The Gillette & Associates audit of the 2012 Section income/expenses has ascertained that Section operations and its cash flow is in conformity with accepted accounting principles through December 31, 2012.

AUDIT REPORT 2012.
STATEMENT OF ACTIVITY
Years Ended December 31, 2012 and 2011

	2011	2012
UNRESTRICTED NET ASSETS		
Unrestricted Revenues, Gains, Losses		
Membership dues	736,879	771,307
Registration, meetings	729,878	732,466
Advertising income	44,328	39,034
Shipping and handling income	27,927	22,210
Publishing and administrative	38,770	37,565
Sale of promotional items	2,492	1,465
Miscellaneous	9,790	8,997
Investment income	64,604	89,095
Rental income	49,635	49,878
Sale of assets	15,400	(21,040)
Total Revenue	1,719,703	1,730,977
Less: Administrative Expenses	(268,273)	(272,944))
Program Expenses	(1,082,475)	(1,120,295)
Add: Unrealized Gain (loss) on Investments	(193,728)	226,216
Change in Unrestricted Net Assets	175,227	563,954
Net Assets at Beginning of Year	3,683,579	3,858,806
Net Assets at End of Year	$3,858,806	$4,422,760

MARKETABLE SECURITIES

	2011	2012	11/11/2013
LPL Investment Reserve	$919,377	$977,968	$1,132,227
LPL Building Fund	$347,034	$372,393	$ 422,304
Wells Fargo Research, Practice, Education	$1,538,562	$1,8260,582	$2,230,401

The 2012 audit demonstrates an increase of $563,954 in net assets from 2011. The Section Executive Director Terri DeFlorian continues to maximize a staff operation which allows the Section to utilize its finances to advance orthopaedic physical therapy practice. The net asset increase correlates with an increase in marketable securities and income generation greater than expenses for 2012. Marketable securities remain strong as of 11/2013 giving the Section continued financial strength for operations.

The following operating budget for fiscal year 2014 has been approved by the Section Board of Directors at their October meeting in LaCrosse.

2014 OPERATING BUDGET

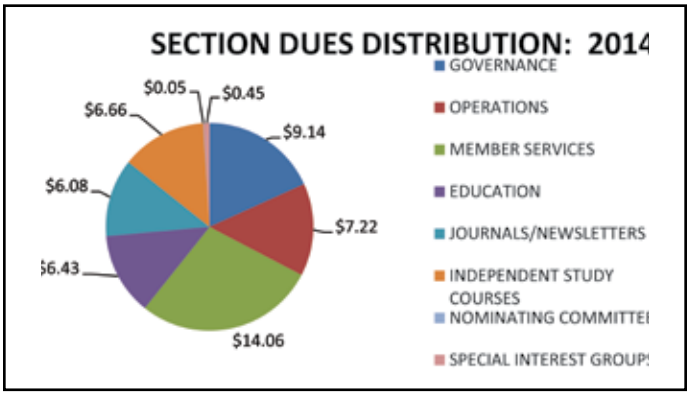
	Income	Expense
GOVERNANCE	164,081	371,848
OPERATIONS	51,454	293,728
MEMBER SERVICES	816,189	572,344
EDUCATION	472,175	261,835
JOURNALS/NEWSLETTERS	166,760	247,601
INDEPENDENT STUDY COURSES	364,460	270,898
NOMINATING COMMITTEE	0	1,865
OCCUPATIONAL HEALTH SIG		$2,500
FOOT AND ANKLE SIG		$2,500
PAIN MANAGEMENT SIG		$2,500
PERFORMING ARTS SIG		$2,500
ANIMAL REHABILITATION SIG		$2,500
IMAGING SIG		$2,500
TOTAL OPERATING	2,035,119	2,035,119

The 2014 budget will continue the Section's effort to progress the evidence-based practice of physical therapy including the Foundation for Physical Therapy, Orthopaedic Section Research Network (2nd year), National Orthopaedic Outcomes Database and ICF guidelines. Additionally, the Section will have their 2nd Annual Meeting in St. Louis providing an opportunity for advanced clinical practice.

The 2014 budget shows an increase in expenses projected of $109,947 above the 2013 level. The strong reserve that the Section has been able to develop over the last several years allows the Section to cover these costs without a dues increase at this time. The Section has been able to retain annual dues at $50.00 since 1994. The Finance Committee is committed to retaining a strong reserve as it allows for opportunities for advancement that might not be possible without these funds. It also allows operations without increasing dues.

Should there be a decline for income production, the Finance Committee would need to recommend a dues increase to meet operation expectations. This is not necessary for the current budgeting period so dues will continue at their current rate through 2014.

At this time, the real estate market in La Crosse does not support the Section moving forward with further rental property, thus a building of the footprint is not recommended. The Board of Director policy is to keep the Building Fund as an opportunity to build in the future should an opportunity present.



If you have questions regarding the audit report for 2012 or the 2014 operating budget, feel free to contact me at Steven@coreptiowa.com.

Orthopaedic Section, APTA, Inc.

FALL BOARD OF DIRECTORS MEETING MINUTES

October 10-11, 2013

Steve McDavitt, President, called a regular meeting of the Board of Directors of the Orthopaedic Section, APTA, Inc. to order at 8:00 AM CT on Thursday, October 10, 2013.

Present:
Steve McDavitt, President
Steve Clark, Treasurer
Tom McPoil, Director
Pam Duffy, Director
Joe Donnelly, Practice Chair
Tess Vaughn, Education Chair
Duane Scott Davis, Research Chair
Tara Fredrickson, Executive Associate
Terri DeFlorian, Executive Director

Guests:
Gerard Brennan, Vice President

Steve McDavitt, President, reviewed the following Ground Rules with the Board -
- Share the air; we want to hear everyone's opinion, even if it is a dissenting one
- Silence implies agreement
- Agree to disagree without being disagreeable
- Honor confidentiality
- Respect all participants and all differences of opinion
- Listen to the person who is talking
- Work to build consensus

The meeting agenda was approved with additions.

The September 9, 2013 Board of Directors Meeting minutes were approved as printed.

The Board of Directors approved the following meeting dates and times –
- November 11, 2013
- December 9, 2013
- January 13, 2014

Pam Duffy informed the Board she will not be able to attend the January 13, 2014 Board meeting.

The consent calendar was adopted as printed.

The following motions were adopted unanimously via e-mail –
=MOTION 1= Steve McDavitt, President, moved that the Orthopaedic Section Board of Directors approve the nomination of Bill Boissonnault for the 2014 APTA Lucy Blair Service Award.
Fiscal Implication: None

=MOTION 2= Steve McDavitt, President, moved that the Orthopaedic Section Board of Directors approve the nomination of Louis Puendedura for the 2014 APTA Eugene Michaels Award.
Fiscal Implication: None

Steve Clark, Treasurer, gave the financial update and reported the budget is based on a 6% return in the reserve fund. This allows the Section to cover our budget expenses without having to increase dues. The larger our reserve fund the better able we are to absorb our budget expenses.

Steve Clark, Treasurer, reviewed the recommendations from the Finance Committee's August meeting.
=MOTION 3= Steve Clark, Treasurer, moved that the Orthopaedic Section Board of Directors approve the following Finance Committee recommendations from their August 23-24, 2013 annual meeting. ADOPTED (Steve McDavitt – in favor; Gerard Brennan, absent; Steve Clark – in favor; Tom McPoil – in favor; Pam Duffy – in favor)
Fiscal Implication: None

Steve McDavitt, President, reported there was no update on the APTA Governance Review at this time.

Steve McDavitt, President, reported that the PTA Advanced Proficiency Pathways work group had their first conference call to discuss development of a survey.

Steve McDavitt, President, led a discussion of the Board Assessment results. The original assessment was completed by the Board prior to the 2012 Fall Board of Directors meeting and the follow up assessment was completed prior to the 2013 Fall Board of Directors meeting. The makeup of the Board was significantly different due to new officers being elected. The perception is that we are doing well. One area indicating a need for improvement was diversity. This will be added to the 2014 Fall Strategic Planning meeting as an item to be included for discussion. The Board agreed that doing an annual assessment each year would be beneficial.

Sharon Klinski, Managing Editor, gave the following update –
- The January 2014 issue of *Orthopaedic Physical Therapy Practice* will highlight the Section's 40th anniversary.
- The current publishing contracts the Section has and when they are each up for renewal was discussed.
- The ISC on Regenerative Medicine is a 2013 course which should be published by the end of the year. The ISC on Evaluation of Animal Rehab Patients is a 2013 course that will not be completed until 2014.
- The Residency Curriculum in a Can ISC offering to residencies is being reviewed by the Practice Committee and will report back to the Board with recommended changes.

=MOTION 4= Steve Clark, Treasurer, moved that the Orthopaedic Section Board of Directors present the following option to Galileo regarding the first floor remodeling –
- Orthopaedic Section Responsibility
  - Pay for all expenses for the build-out proposed by Galileo with prior approval from the Section for construction plans.
  - Pay for new floor coverings and vinyl base in all areas of renovations as well as throughout the total Galileo space (routine maintenance expense).
- Work with contractors recommended by Galileo as long as bids are competitive.
- Galileo Responsibility
  - Work with contractors to obtain bidding and work completion.
  - Furnishings for conference room as determined necessary for their operation.
- Galileo Lease Terms
  - 5-year lease.
  - 3% increase from 2013-14 levels for 2014-15 based upon actual square footage designated to Galileo use.
  - CPI – 3% minimum escalation for years 2, 3, 4 and 5 of this lease.
  - Outfitting conference room (cabinets) as desired.

ADOPTED (unanimous)
Fiscal Implication: Funds for construction to come from the LPL Building Fund.

=MOTION 5= Gerard Brennan, Vice President, moved that the Orthopaedic Section Board of Directors approve the ISC Policies and Cover Page with changes.
Fiscal Implication: None

The Board discussed the motion and moved the following –
=MOTION 6= Pam Duffy, Director, moved that the Orthopaedic Section Board of Directors refer Motion 5 to Gerard Brennan, Vice President; Tom McPoil, Director; Chris Hughes, ISC Editor; and Terri DeFlorian, Executive Director, for further review and development to include ISC Editor and Associate Editor responsibilities, ISC Advisory Panel responsibilities, category of penalties, and defining completion deadlines for financial projections with a report back to the Board at their 2014 CSM meeting. ADOPTED (unanimous)
Fiscal Implication: None

Tess Vaughn, Education Chair, reported on the following –
- 40th anniversary plans for CSM 2014.
- 2014 Annual Orthopaedic Section Meeting which will include a Board meeting on Friday evening.
- Possible cities for the 2015 Annual Orthopaedic Section Meeting to include Phoenix/Scottsdale and San Antonio.

Scott Davis, Research Chair, reported on the following –

- External grant submission deadline is November 15, 2013. No grant applications have been received to date.
- Review of CSM 2014 poster and platform abstracts was completed in July 2013. A total of 389 abstracts were received.
- Updates on the Rose Award, JOSPT Award and Orthopaedic Section Research Poster Award.
- CRN Advisory Board recently approved the Year 1 – 6 month report from Steve George, Principal Investigator.

Joe Donnelly, Practice Chair, reported on the following –

- An Osteo-blast will be sent in November 2013 reminding members of the Advocacy Grants available through the Section. None have been submitted to date.
- **=MOTION 7=** Joe Donnelly, Practice Chair, moved that the Orthopaedic Section Board of Directors create a 2 hour education session at the 2014 Annual Orthopaedic Section Meeting titled; *How to Use the Orthopaedic Section's Curriculum in a Can to Start or Enhance an Orthopaedic Residency Program*. ADOPTED (Steve McDavitt, President – in favor; Gerard Brennan, Vice President – absent; Steve Clark, Treasurer – in favor; Tom McPoil, Director – in favor; Pam Duffy, Director – in favor)

Fiscal Implication: None

- The following motion was adopted at the 2013 July Board meeting -
  =MOTION 6= Steve McDavitt, President, moved that the Orthopaedic Section Board of Directors charge the Practice Committee to create an operational definition, parameters and criteria that meet Strategic Plan Outcome 3. Public Identity and Promotion of Physical Therapy; Objective B, Develop an alliance with a minimum of 5 professional organizations to work towards the mutual goal of promoting musculoskeletal care by 2015, with a report back to the Board at the 2013 Fall Board meeting. ADOPTED (Steve McDavitt – in favor; Gerard Brennan – in favor; Steve Clark – in favor; Pam Duffy – in favor; Tom McPoil – absent)
  The Board agreed that this motion needs to be revised since APTA is the body that does this, not the Section. This will be included on the 2014 Fall Strategic Planning meeting agenda for discussion.
- **=MOTION 8=** Tom McPoil, Director, moved that the Orthopaedic Section Board of Directors charge the Practice Committee with utilizing social media to develop practical applications of the clinical practice guidelines for PTs and PTAs to translate evidence into practice. ADOPTED (Steve McDavitt, President – in favor; Gerard Brennan, Vice President – absent; Steve Clark, Treasurer – in favor; Tom McPoil, Director – in favor; Pam Duffy, Director – in favor)
  Fiscal Implications: None
- Request 5 minutes on the agenda at the 2014 CSM Component Leadership Meeting for the Orthopaedic Section President to inform Chapter Presidents that the Section has advocacy grants available.

Steve McDavitt, President, reviewed the following motion from the July 2013 Board of Directors meeting in La Crosse –

=MOTION 2= Pam Duffy, Director, moved that the Orthopaedic Section Executive Committee work with staff to bring a proposal forward to the Board on a transition plan for the Editor of OPTP and Editor of ISCs by the Fall Board of Directors meeting 2013. ADOPTED (Steve McDavitt – in favor; Gerard Brennan – in favor; Steve Clark – in favor; Pam Duffy – in favor; Tom McPoil – absent)

It was reported that the transition plan will be putting an Associate Editor in place for both ISCs and OPTP.

Tom McPoil, Director, reviewed the following motion from the July 2013 Board of Directors meeting in La Crosse –

=MOTION 22= Tom McPoil, Director, moved that the Orthopaedic Section Board of Directors charge the OPTP Editor to go through a search process to recruit 2 associate editors and make a recommendation to the Board on who to appoint at the 2013 Fall Board Meeting. ADOPTED (unanimous)

=MOTION 9= Steve McDavitt, President, moved that the Orthopaedic Section Board of Directors amend Motion 22 from the July 2013 Board of Directors meeting in La Crosse as follows, '…search process to recruit 2 associate editors….' to '…search process to recruit 1 associate editor…'. ADOPTED (Steve McDavitt, President – in favor; Gerard Brennan, Vice President – absent; Steve Clark, Treasurer – in favor; Tom McPoil, Director – in favor; Pam Duffy, Director – in favor)

Fiscal Implication: None

Steve Clark, Treasurer, led a discussion on the ISC profit and loss picture as it related to the current budget year so budgeting can be done based on realistic expectations.

Gerard Brennan, Vice President, participated by conference call to give the technology update.

=MOTION 10= Steve McDavitt, President, moved that the Orthopaedic Section Board of Directors charge the Technology Team to draft a list of web based products and opportunities as proposed in the PCG minimum and nice to have offerings and send to JOSPT and APTA asking if they can provide these and what the cost would be. Report back to the Board at their January 2014 conference call meeting. ADOPTED (unanimous)

Fiscal Implication: None

=MOTION 11= Tom McPoil, Director, moved that the Orthopaedic Section Board of Directors charge Gerard Brennen, Vice President, to contact EBSCO regarding the proposed changes in the license agreement between EBSCO and OPTP. ADOPTED (unanimous)

Fiscal Implication: None

Pam Duffy, Director, lead a discussion on whether or not the Board should consider adding the ISC/OPTP Editor to the Board of Directors as a non-voting advisory member. The Board agreed not to pursue this as this time but on an as needed basis invite the Editor to a Board meeting.

=MOTION 12= Steve McDavitt, President, moved that the Orthopaedic Section Board of Directors charge the Executive Director to ask all SIG Presidents to supply a report, by December 31, 2013, that includes addressing the duties and responsibilities outlined in the SIG EIG Rules of Order, a list of their current officers, individuals who are being sought after to assume leadership roles, and a list of information they have published in OPTP during their term as president. ADOPTED (Steve McDavitt, President – in favor; Gerard Brennan, Vice President – absent; Steve Clark, Treasurer – in favor; Tom McPoil, Director – in favor; Pam Duffy, Director – in favor)

Fiscal Implication: None

The Board of Directors reviewed the draft nomination form to be used by the membership when nominating someone for an elected position on the Board. The Board agreed there should be 2 forms; one for individuals to nominate themselves, and a second for individuals to nominate others. Tara Fredrickson, Executive Associate, will draft and bring back for the Board to review.

The Board appointed Steve McDavitt, President, as liaison to the Nominating Committee. Steve McDavitt and Tara Fredrickson will contact the Nominating Committee Chair asking them to provide a report stating how many people were contacted to run for vacant positions, what strategies did they use to mentor upcoming nominating chairs, what challenges they encountered in getting individuals to commit to run for a position, how they determined (what criteria did they use) who they would contact to run for positions, with a report back to the Board by December 31, 2013.

The Board agreed the Section should develop a survey asking members if they are interested in being nominated to an elected position and if so, which one(s) and when they would be willing to run. The survey should be sent annually and a spreadsheet developed to track the results.

Pam Duffy, Director, gave an update on recertification for the Orthopaedic Certified Specialist exam from the report submitted by Bill O'Grady, ABPTS member.

Pam Duffy, Director, reported on the activities of the OHSIG and FASIG.

The following motion from the 2012 Fall Board of Directors meeting was brought forth for discussion.

=MOTION 16= Tom McPoil, Director, moved that the Orthopaedic Section Board of Directors bring a proposed bylaw amendment to the membership meeting at CSM 2013 to add 2 new voting members to the Board of Directors. ADOPTED (James – Yes; Gerard – Yes; Steve – No; Bill – Yes; Tom – Yes)

Fiscal Implication: None

=MOTION 13= Tom McPoil, Director, moved that the Orthopaedic Section Board of Directors rescind Motion 16 from the 2012 Fall Board of Directors meeting that proposed a bylaw change that would add 2 new voting members to the Board. ADOPTED (unanimous)

Fiscal Implication: None

According the Section bylaws, a vote of the membership is required to move the addition of 2 directors to a general membership vote. A vote was not taken at the 2013 membership meeting. The proposed amendment was only presented. This will be brought up at the 2014 membership meeting.

Tom McPoil, Director, reported on the activities of the Membership Committee, PMSIG and PASIG from their reports.

Steve McDavitt, President, was named the new liaison to AAOMPT.

Gerard Brennan, Vice President, reported on the activities of the Awards Committee and Imaging SIG.

(Continued on page 64)

2014 Annual Orthopaedic Section Meeting

St. Louis, Missouri | Hyatt Regency St. Louis at the Arch

May 15–17, 2014

The Triangle of Treatment: Integrating Movement System Impairments, Manual Therapy and the Biopsychosocial Approach in the Treatment of the Upper Quarter

Dedicated to Advanced Orthopaedic Practice for Physical Therapists

The first Annual Orthopaedic Section Meeting in Orlando was a resounding success and we are excited to present our second Annual Orthopaedic Section Meeting in St. Louis, Missouri. This is a unique 2-day meeting focusing on the latest clinical strategies in the clinical management of the upper quarter. The format will include lecture and laboratory experiences with outstanding speakers who are experts in their fields and leaders in clinical research. The breakout lab sessions are small in size to allow for hands-on instruction and feedback from the presenters and lab assistants. The general sessions will consist of a panel of speakers who will discuss how to integrate physical therapy treatments to achieve the best outcomes for patients with Upper Quarter dysfunctions. Attendees will have the ability to choose among multiple breakout sessions during both days of the conference. **We hope to see you at the Arch!**

Program Information

Thursday, May 15, 2014

***Complimentary Session**
3:30PM–5:30PM

Lacking Resources to Implement the Didactic Portion of an Orthopaedic Residency Program? The Section's "Curriculum in a Can" Can be the Answer You are Looking For!
Speakers: Joseph M. Donnelly, PT, DHS, OCS; Aimee Klein, PT, DPT, DSc, OCS
*** This session will be offered to the first 50 attendees who would like to attend.*

Opening Reception & Keynote Presentation: 6:00 PM – 9:00 PM

Skills to Succeed in a Changing Health Care Environment
Speaker: Alan Jette, PT, PhD, FAPTA

Friday, May 16, 2014

Daily Schedule: 8:00AM–5:00PM
General Session: 8:00AM–10:00AM

The Movement System Impairment, Manual Therapy and Biopsychosocial Approach to Neck Pain: Are Similarities and Differences Complementary or Competitive?
Speakers: James Elliott, PT, PhD; Shirley Sahrmann, PT, PhD, FAPTA; Patricia M. Zorn, PT, MAppSci (MT), FAAOMPT; and (*pre-recorded presentation*) Gwendolen Jull, Dip Phty, Grad Dip Manip Ther, M Phty, PhD, FACP

Concurrent Breakout Sessions:
** On Friday, four concurrent breakout sessions will be offered. The registrant will attend three out of four breakout sessions following the morning general session, based on order of preference indicated on the registration form. Note: space is limited, and therefore the attendee's breakout session assignments will be given on a first-come, first-serve basis.

Session 1: Towards a Neurob-eye-ological Understanding of Traumatic Neck Disorders
Speakers: James Elliott, PT, PhD; Janet Helminski, PT, PhD

Session 2: Neck Pain: The Examination and Treatment of Neck Pain using an Integration of the Movement System Impairment Approach and Manual Therapy
Speakers: Shirley Sahrmann, PT, PhD, FAPTA; Patricia M. Zorn, PT, MAppSci (MT), FAAOMPT

Session 3: Mind Matters: Integrating Neural Mechanisms into Pain Management
Speaker: Kathleen Sluka, PT, PhD, FAPTA

Session 4: Integrating Movement System Impairments and Manual Therapy in Assessment and Treatment of the Cervical Spine
Speakers: Kenneth A. Olson PT, DHSc, OCS, FAAOMPT; Michael Wong, PT, DPT, OCS, FAAOMPT

Application of Ultrasound Imaging for Orthopaedic & Sports Conditions

Ultrasound Imaging (USI) is fast becoming an adjunct to physical therapist management of orthopaedic and sports conditions. From the Olympics and professional sports to high school sports and outpatient practices USI is the leading edge of orthopaedic & sports patient management. The course will present the physical therapy application of USI for common shoulder, elbow, knee and ankle conditions. The course will provide an overview of the technical aspects of USI. Identification of normal sono-anatomy and abnormal morphology will be presented. The indications for, and limitations of, USI in musculoskeletal conditions will be discussed. Participants will apply techniques learned using hands-on sessions with live demonstrations and practice sessions. The practical aspects of incorporating USI into PT practice will be presented including equipment, marketing, payment and practice considerations.

Speakers: Scott Epsley, PT, SCS; Wayne Smith, DPT, MEd, SCS ATCr, RMSK; Douglas M. White, DPT, OCS, RMSK

FEBRUARY 3-6, 2014 • LAS VEGAS

CSM

COMBINED SECTIONS MEETING OF THE AMERICAN PHYSICAL THERAPY ASSOCIATION

Orthopaedic Section Preconference Courses

2014 Combined Sections Meeting Las Vegas, Nevada February 3-6, 2014

Advanced Thrust and Non-Thrust Manipulation of the Cervical Spine and Thorax with Integration of Exercise

This course will focus on the manual physical therapy examination, classification, and treatment of cervical and thoracic spine disorders with integration of an evidence-based manual physical therapy approach to address select cervical and thoracic spine and rib cage disorders. Emphasis will be placed on instruction of advanced thrust and non-thrust manipulation techniques with integration of specific therapeutic exercises to address impairments of the cervical spine and thorax.

Speaker: Kenneth A. Olson, PT, DHSc, OCS, FAAOMPT

For more information and to register, visit our web site:

www.apta.org/csm/programming

Saturday, May 17, 2014

Daily Schedule: 8:00AM–5:00PM
General Session: 8:00AM–10:00AM

Using Movement System Diagnoses Versus Pathoanatomic Diagnoses in Everyday Clinical Decision Making
Speakers: Marshall LeMoine, PT, DPT, OCS; Paula Ludewig, PT, PhD

Concurrent Breakout Sessions:
** On Saturday, four concurrent breakout sessions will be offered. The registrant will attend three out of four breakout sessions following the morning general session, based on order of preference indicated on the registration form. Note: space is limited, and therefore the attendee's breakout session assignments will be given on a first-come, first-serve basis.

Session 5: Triangles of Treatment for Masticatory Muscle Pain
Speakers: Steve Kraus, PT, OCS, MTC, CCTT

Session 6: Examination and Treatment of Movement System Impairments of Selected Conditions of the Hand and Elbow
Speaker: Cheryl Caldwell, PT, DPT, CHT

Session 7: Integration of Biomechanics and Movement Classifications in Shoulder Rehabilitation
Speakers: Paula Ludewig, PT, PhD; Shirley Sahrmann, PT, PhD, FAPTA

Session 8: Integrating Movement System Impairments and Manual Therapy in Assessment and Treatment of Shoulder Dysfunction
Speakers: Marshall LeMoine, PT, DPT, OCS; Michael Wong, PT, DPT, OCS, FAAOMPT

This meeting will be held at the beautiful Hyatt Regency St. Louis at the Arch Hotel. Visit our web site at:https://www.orthopt.org/content/c/orthopaedic_section_2014_annual_meeting for full details regarding this exciting meeting, to book your guestroom, and to register.

Do you enjoy baseball? We have been informed that with the release of the 2014 St. Louis Cardinals baseball schedule, they will be playing both the Chicago Cubs and the Atlanta Braves at home during the same dates as our Annual Orthopaedic Section Meeting!

Additional Questions? Call toll free: 800-444-3982 x 2030
or visit our web site at: *www.orthopt.org*

40TH ANNIVERSARY
Celebrating 40 Years
Orthopaedic Physical Therapy 1974-2014

President's Message

Lorena P. Payne, PT

We welcome Chris Studebaker and Fran Kistner to the Board. They bring a wealth of knowledge and energy. You will be hearing from Chris as Membership/Communication Chair and Fran as Research Chair. The addition of their time and talents benefit every member as the SIG continues to strive to be a resource for members, regulators, the insurance industry, and corporations.

Combined Sections Meeting in Las Vegas is fast approaching. We are looking forward to sharing information and current concepts relative to prevention, wellness, and the treatment of workers. Programming is Tuesday, February 4, 8 a.m. to 1 p.m. Join us for the Occupational Health SIG Meeting from 12:00 p.m. to 01:00 p.m. Look for these sessions in "Venetian D."

Functional Job Descriptions: The place to begin and end when managing work place injury prevention and treatment. "Can I go back to work?" Answering this question with uncertainty can lead to negative consequences. Would your decision stand up to a legal challenge? What is the chance of reinjury if returned to regular duty? Answering questions related to employment, work and injury can be facilitated with an accurate, valid functional job description. Join in this session for an interactive discussion of the life and times of a functional job description.

Workforce Trends and Their Impact on PT Practice: Aging, Obesity, and Other Complications

This session will explore changing workforce trends. The speakers will offer insight into how these trends impact the health care and physical therapy industries. Implications of the increased number of aging or obese individuals wishing to remain productive in the work force will be discussed. Clinical management techniques, specific ergonomic modifications, and advanced return-to-work programs will be presented.

In the following article, John Lowe discusses the importance of recognizing the functional goals of every person that we see. Regardless of the circumstances of the injury or illness, there is an impact upon ability to perform within the context of gainful employment. Identification of essential job functions is a prerequisite to formulating appropriate treatment plans, clinically based interventions, job site intervention, and goal setting.

Occupational Health: It's Not Just Workers' Compensation

John Lowe, PT
Onsite & Implementation Specialist, WorkWell
(jlowe@workwell.com)

INTRODUCTION

Occupational health is a term that to most people, health care providers included, typically connotes workers' compensation. In reality however, occupational health encompasses any patient who presents with an illness or injury that precludes returning to a desired work situation. For example, if an individual presents at your clinic for rehabilitation after falling off a ladder while cleaning the gutters at home and sustaining an injury that prevents him/her from returning to work and thereby earning a living, would not one of the treatment goals typically be progressing your patient's physical abilities to allow returning to work? The term occupational health therefore refers to an employee's overall health and ability to perform the essential physical demands of his/her job.[1] Impairments that affect this may be work related or non-work related.

Costs to individuals and employers from work time lost as the result of prolonged health-related absence run beyond merely medical costs. The employee has the physical and emotional trauma of the injury or illness, possibly combined with psychosocial issues such as financial concerns. The employer has to find someone to do the work that your patient was doing. Short-term they might use some combination of supervisors, overtime, and contract labor to cover. Prolonged absences may also require recruitment and training costs involved with hiring replacement workers.[2]

Scope of the Problem

Employee lost time and/or impaired ability to work due to illness or injury may continue to increase as a result of several factors, not the least of which is the aging of the American workforce. Demographics in the United States as well as many other countries indicate that a generation—the baby boomers—are reaching and exceeding middle age.

For a number of reasons members of this generation in many cases continue working on either a full or part time basis longer than anticipated.

The generation following the baby boomers is smaller numerically.[3] This has resulted in the average age of the workforce increasing and current or projected shortages of workers in a number of occupations. Jobs requiring advanced education and training such as health care professionals, tool and die makers, electricians, and welders often incentivize employees to continue working beyond typical retirement age in order to offset shortages of skilled and experienced labor.

Events in the financial markets, changes in the employment

marketplace, and in many cases poor planning has left many people approaching their 60s unable to afford retirement or if not unable at least concerned to the point where they elect to continue working. A survey by the American Association of Retired Persons (AARP) disclosed that 79% of baby boomers plan to work in some capacity during their retirement years and that 25% of them feel they will not be able to afford retirement.[4] The last 50 years has seen a shift from defined-benefit retirement plans (typically funded mostly if not entirely by the employer) to voluntary retirement plans (known as defined contribution plans) that are largely if not totally employee-funded such as 401ks and IRAs. Fewer workers are able to rely upon traditional pensions for a significant portion of their retirement income. Workers who rely on self-funded retirement vehicles which are often invested in mutual funds or other equity vehicles are responsible for the amount of contribution, method of investment, and for taking an overall more active role in planning their retirement. They are exposed to the market risk inherent in the stock and bond markets, resulting in fluctuating values.[5]

Aging workers have of course many of the age-related maladies we as physical therapists encounter daily in our practices. Obesity, arthritis, hypertension, diabetes, and other medical conditions can limit or even prohibit participation in an occupation.[6] For example, workers with osteoarthritis report losing up to 31% of their productive time while at work and an additional 8% resulting from absenteeism as a consequence of their disease.[7] Additionally, while statistically older workers are not necessarily more likely to be injured while working than younger workers, they may sustain more severe injuries and recover from injuries slower than younger workers.[8]

Two disturbing trends indicate that the problem is not necessarily confined to older workers. An estimated 21 million Americans were diabetic in 2005. This is projected to grow by at least 54%.[9] Additionally, 34% of Americans are currently considered to be obese, a trend that also continues a disturbing increase.[10] Chronic and acute medical conditions or injuries may of course impact an individual's occupational participation and productivity in a manner that restricts or precludes their ability to earn a living and therefore need to be addressed during the rehabilitation process.

Implications for Physical Therapists and Physical Therapist Assistants

Physical therapists work with patients to resume preinjury or pre-illness level of function, or in cases where the severity of the patient's impairments rules that out, at least maximize their physical abilities. This concept holds true regardless of who is reimbursing for treatment.

Patients enter our clinics daily for rehabilitation of orthopedic, neurological, and other assorted medical disorders. Causal factors are as diverse as strokes, work injuries, cancer, heart conditions, sports injuries, and COPD. And they may be receiving treatment in a hospital, an outpatient clinic, a rehabilitation center, or onsite at a workplace. The underlying concepts to restore physical function are the same:

- What does this person need to do physically?
- To what degree can he or she currently perform each activity?
- What are the physical impairments limiting performance of those activities?
- How do we address these impairments?

Evaluations, subsequent treatments, and re-evaluations should include asking about and planning for work-related issues in addition to ADL performance. Find out what your patient's current work status is. If the person is currently working their normal job without difficulty, treatment goals obviously would not include occupational factors. If your patient is currently unable to earn a living performing a job or is working in a light duty capacity, find out what they were doing previous to their illness or injury. What are the patient's goals regarding returning to work? Does he or she have any concerns about returning to their job? If so, what are they?

Evaluating, planning, and executing a treatment plan designed to return someone to a specific occupational situation means the treating therapist needs to know the essential functions of that job for both workers and no-workers compensation patients. Every job requires specific physical activities. These include not only factors such as lifting, pushing, and pulling forces, but also positional requirements such as standing, reaching, performing low work, and so forth. If a worker cannot perform these specific physical activities, she or he cannot do their job. Finding out what is physically essential for a patient in order to perform a job is probably best achieved by going to the workplace and analyzing the job. However many physical therapists do not have the inclination, training, experience, and/or comfort level to do functional job analysis. This doesn't mean it should be ignored any more than we would recommend releasing a patient to return to a home environment following surgery without having any knowledge of the architectural barriers present in the home. At a minimum obtain as much information as possible from the patient and by contacting the employer (often times employers can provide job descriptions).

Knowing what a patient needs to do physically in order to make a living allows the clinician to structure evaluations, treatments, and documentation to address the effect of current impairments on job performance. This requires documentation of patient current work status and their goals for returning to work. We can also do some job-related functional testing and document current demonstrated abilities vs. required physical abilities. This in turn allows us to design the treatment to specifically address demonstrated physical shortcomings that impact resuming preinjury (or other if the person plans to work at a different job than their preinjury one) work duties. This is no different than designing treatment interventions to address ADL items such as negotiating stairs, dressing, etc. The underlying thought process is the same: find what the essential physical requirements are for performance of the required tasks, evaluate the patient's current ability to perform these, document your findings, and set up a treatment program to develop your patient's ability to perform these tasks.

Occupational health also involves developing strategies for continuing work with chronic medical conditions and injuries. This involves working with the employer to find out what sort of worksite physical accommodations are reasonable. Patients with chronic physical impairments may benefit from interventions such as[1]:

- Transitional work: gradually increasing the physical stresses of the job by progressing the duration and intensity of the physical activity, thereby allowing the patient to adapt to the workload.

- Work station modification: adjusting the physical environment the patient works in to minimize mechanical stresses that might exacerbate the patient's condition.
- Work task modification: working with the patient and employer to develop ways to perform required work tasks in a manner that minimizes stress on injured joints and tissues.
- Using modified tools or other adaptive equipment: the same concept as work task modification. Examples of modified equipment include different kinds of computer keyboards and mouse, modified grips on hand tools, anti-fatigue floor mats, and spring-loaded pallets.
- Exercise programs of focused strengthening and/or stretching activities to maintain flexibility and strength gains from treatment and hopefully thereby minimize the likelihood of exacerbation.
- Wellness: general diet, exercise, and lifestyle improvement programs that improve an individual's overall health and well-being can reduce health-related work absenteeism.

CONCLUSION

Occupational health is a part of practice even for physical therapists that do not typically treat workers compensation patients. We work with our patients to restore function lost as the result of an illness or injury. If a patient is employed, and if the illness or injury incurred prevents or inhibits their ability to work, one of the goals of treatment may be resuming work. This requires specific functional restoration based on the essential physical requirements of the patient's occupation. Effective treatment requires understanding the physical requirements essential to performance of each patient's job, preparing the patient to tolerate those specific physical stresses, and effectively communicating with other medical professionals, the employer, and the payor the treatment goals, rationale and progress.

REFERENCES

1. The Physical Therapist in Occupational Health Guidelines, Orthopaedic Section APTA/Occupation Health SIG Guidelines. www.orthopt.org
2. Perils in the workplace. Compensation and working conditions. Bureau of Labor Statistics, Fall. 1997:61-64. www.bls.gov
3. Toossi M. A century of change: the U.S. labor workforce, 1950-2050. *BLS Monthly Labor Review*. May 2002:15-28.
4. AARP. Survey of baby boomers' expectations for retirement. 2004. http://research .aarp.org.
5. BLS spotlight on statistics: Older workers. U.S. Bureau of Labor Statistics, 2008. www.bls.gov/spotlight
6. Dibonaventura MD, Gupta S, McDonald M. Sadosky A. Evaluating the health and economic impact of osteoarthritis pain in the workforce: results from the National Health and Wellness Survey. *BMC Musculoskelet Disord*. 2011;12:83.
7. Rogers E, Wiatrowski WJ. Injuries, illnesses, and fatalities among older workers. *BLS Monthly Labor Review*. Oct 2005:24-30.
8. Mitchell OS. The relation of age to workplace injuries. *Monthly Labor Review*. July 1988:8-13.
9. Center of Disease Control and Prevention. release, June 2013. www.cdc.gov/nchs/data/nhis/early release201306_14.pdf
10. Fryar CD, Carroll MD, Ogden CL. Prevalence of overweight, obesity, and extreme obesity among adult: United States, Trends 1960-1962 through 2009-2010. Center of Disease Control and Prevention, Sept 2012. http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overweight/overweight_adult.pdf.

Orthopaedic Section, APTA, Inc.

FALL BOARD OF DIRECTORS MEETING MINUTES
October 10-11, 2013

(Continued from page 59)

=MOTION 14= Steve McDavitt, President, moved that the Orthopaedic Section Board of Directors approve the Section and the Hand Rehabilitation Section collaborate and utilize their combined resources to create clinical practice guidelines Management of Distal Radius Fractures, (1) coordinated by the Orthopaedic Section ICF-based Clinical Practice Guidelines Coordinator and Advisory Panel, (2) to be published in JOSPT, (3) using the following listing in the title: Clinical Practice Guidelines linked to the International Classification of Functioning, Disability, and Health from the Section on Geriatrics and Orthopaedic Section of the American Physical Therapy Association, 4) utilizing the following copyright and permission statements: ©201_ Orthopaedic Section American Physical Therapy Association (APTA), Inc., and the Section on Geriatrics, APTA, Inc., and the *Journal of Orthopaedic & Sports Physical Therapy* consent to the reproducing and distributing this guideline for educational purposes, and 5) submit to have the guideline on www.guidelines.gov.
ADOPTED (unanimous)
Fiscal Implication: None

=MOTION 15= Steve McDavitt, President, moved that the Orthopaedic Section Board of Directors approve a one day meeting at CSM 2014 for the 9 individuals of the Neck Pain Revision workgroup to organize, review, and appraise articles for the revision. ADOPTED (unanimous)
Fiscal Implication: Total = $2,277

Steve McDavitt, President, reported on the activities of the ARSIG and the outcomes database.

=MOTION 16= Steve Clark, Treasurer, moved that the Orthopaedic Section Board of Directors approve the 2014 as revised. ADOPTED (unanimous)
Fiscal Implication: None

=MOTION 17= Steve McDavitt, President, moved that the Orthopaedic Section Board of Directors approve developing a student information packet on the benefits of membership and send via an Osteo-blast. We would then eliminate the welcome breakfast at CSM 2014. ADOPTED (Steve McDavitt, President – in favor; Gerard Brennan, Vice President – absent; Steve Clark, Treasurer – in favor; Tom McPoil, Director – in favor; Pam Duffy, Director – in favor)
Fiscal Implication: None

=MOTION 18= Joe Donnelly, Practice Chair, moved that the Orthopaedic Section Board of Directors charge the Practice Committee with reviewing the residency and fellowship residency curriculum information for clarity and consistency on what we are providing with a report back to the Board with recommendations. ADOPTED (Steve McDavitt, President – in favor; Gerard Brennan, Vice President – absent; Steve Clark, Treasurer – in favor; Tom McPoil, Director – in favor; Pam Duffy, Director – in favor)
Fiscal Implication: None

The following was brought up under closing comments -
- Reviewed meeting logistics and agreed to continue using this format for future meetings in La Crosse.
- Discussed purpose of having a Board meeting at the 2014 Annual Meeting.

ADJOURNMENT 4:30 PM CT Friday, October 11, 2013
Submitted by Terri DeFlorian, Executive Director

FOOT & ANKLE

SPECIAL INTEREST GROUP

MESSAGE FROM THE PRESIDENT

I am constantly reminded by FASIG members as to the clinical relevance of this column. Feedback is always positive and information about research and/or clinical pearls is consistently desired. A recent Osteo-blast was produced by the Section to all members. The response was low. Let me take this opportunity to again encourage all FASIG members to use this forum as a place for publicizing ideas and research, or to simply communicate interesting foot and ankle information. Research on topics pertaining to the foot and ankle continues to be generated, lending to active and bright clinical opportunities. Again, consider using this column as a vehicle for research topics or ideas!

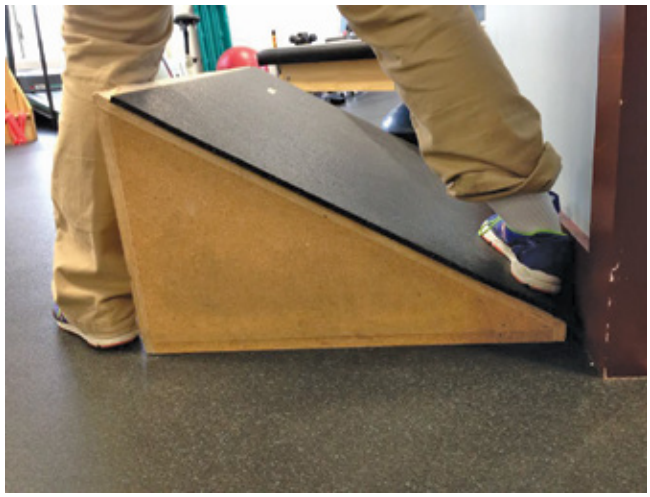
FASIG LOOKS AT COMMON REARFOOT CONDITION

The FASIG's focus in this issue includes a new look at rehabilitation of the surgically corrected Haglund's deformity. This is also called Mulholland's deformity or the "pump bump." Physical therapists commonly encounter this condition both conservatively and postsurgically, the latter presentation calling for a rehabilitation protocol that includes a working knowledge of tissue healing, particularly the attachment site of the Achilles tendon into the calcaneus. Just how the Haglund's deformity, a calcaneal exostosis, is related to an insertional spur or tendinopathy, is worth exploring.

Kaylee Peluso, DPT, begins the examination of a patient with Haglund's deformity. In this issue, a case is presented and conservative interventions are discussed. The role a physical therapist can play in the diagnosis and treatment of this pathology is presented along with specific interventions. In the next issue, surgical solutions and techniques will be presented, along with appropriate protocol strategies.

CLINICAL PEARL: FIBULARIS STRETCH

Re-establishing range of motion at an articulation is critical to the function of that joint. In the case of limited rearfoot inversion or limited forefoot supination, due to passive insufficiency of the fibularis brevis and/or longus, clinicians look for ways to stretch the ankle everters. The accompanying photo demonstrates a stretching option.



Using the slant board, ask the patient to "pin" the right foot against the vertical wall, but still on the slanted board. The opposite limb is positioned as if to perform a right hip adductor stretch. As the left leg and knee bend, the right leg is lowered, enhancing the inversion angle at the ankle. Note: great care should be afforded to lock the rearfoot against the wall.

Exercise Considerations Following Insertional Calcaneal Spur Resection

Kaylee M. Peluso, PT, DPT, is a graduate of Daemen College, magna cum laude. She currently practices in outpatient orthopaedics.

Patients with post-calcaneal spur resection are seen as commonly as patient's post-Achilles' tendon repair.[1] Unlike an Achilles' tendon repair, a standard protocol is not in place for a calcaneal spur resection. This article will attempt to address physical therapy and exercise considerations following calcaneal spur resection, as well as how it differs from an Achilles' tendon repair.

An insertional calcaneal spur is a calcific growth around the insertion of Achilles' tendon on the calcaneus. This exostosis is a result of an anatomical change of the calcaneus, the cause of which is multifactorial.[2] Predisposing factors include a cavus foot and increasing age. A cavus foot places more tension on the plantar fascia, as well as the nerves innervating around the heel. This prolonged stress can lead to not only a spur formation; but also discomfort with weight bearing. Excess weight or obesity may also play a role.[2]

In an athletic population, some common training errors have been shown to precipitate the formation of a spur. The surface on which one exercises can play a role. For example, running or exercising on harder, less forgiving surfaces (such as concrete or cement), challenges the foot's ability to absorb shock. This can be compounded by footwear, including ill-fitting, overused, or inappropriate footwear.

CASE PRESENTATION

A 55-year-old year printing-press operator (RK) presents to our clinic after 6 months of right heel pain. He cannot report a causation or traumatic event that brought about the pain. However, it has become more frequent and severe in intensity. When questioned about changes in activity, RK reports that he has recently taken up "walking with his wife" at night. He states that "being on his feet" will exacerbate pain.

He was referred from podiatrist. X-Rays revealed a calcaneal spur, around the insertion of the Achilles' tendon. RK also reports that MD prescribed an anti-inflammatory at his last appointment, 1 week ago.

Postural evaluation of RK reveals cavus feet in weight bearing, as well as Haglund's deformity bilaterally. Examination also reveals decreased overall mobility of talocrural joint, and significantly decreased extensibility of gastroc-soleus complex. RK was unable to complete more than 5 heel raises at time of examination, secondary to pain. Special tests were negative for ligamentous involvement. Neurological screen was unremarkable. Although RK reported pain for 5 months, his symptoms categorized him as being in the acute stage. The area was swollen, as well as extremely tender to palpation over the Achilles tendon, and over the plantar arch. Multiple trigger points were palpated through the fibularis muscles and gastroc-soleus complex.

Because of the acute nature of his presentation, treatment began with a lengthy discussion on RK's level of activity. Work and recreational activities require RK to spend a lengthy amount of time on his feet. At this point we issued a walker-boot. The boot had a dual purpose: to reduce the amount of movement of the Achilles' and associated tendons, and to reduce inflammation. He was also educated on the R.I.C.E principle (Rest, Ice, Compression, Elevation). Ultrasound (dosage: 0.8 W/cm^2, 50%) to the Achilles' tendon was applied during this phase for tissue healing. Exercise was kept light, stressing gastroc-soleus complex stretching.

After approximately 2 weeks, in response to decreased swelling and an increase of active range of motion, we discontinued the boot. However, RK's pain remained minimally changed. At this point, orthotics were proposed. Based on RK's symptoms, we used heel lifts, on the premise to reduce the length of the Achilles, thus reducing the amount it would have to stretch. Heel lifts can also be helpful in moving the heel away from the back of the shoe, reducing irritation. Eccentric plantarflexion exercise was also introduced. While RK adjusted to the heel lifts, we began to focus on strengthening of the fibularis, through an elastic band program with varying resistances. RK tolerated treatment well, but was unable to achieve pain reduction through therapeutic techniques.

At approximately 4 weeks of therapy, without significant improvement, we referred the patient back to his specialist for consult. Strength was measurably unchanged in the foot and ankle. The FAAM score was unchanged. Tolerance for standing and walking was also unchanged.

The referring podiatrist elected to perform surgical excision of the insertional spur. In the next publication, the rehabilitation associated with the surgical procedure will be discussed, including postoperative precautions, exercise considerations, and imaging results.

REFERENCES

1. Thomas JL, Christensen JC, Kravitz SR, et al. The diagnosis and treatment of heel pain: A clinical practice guideline revision 2010. *J Foot Ankle Surg*. 2010;49(3 Suppl):S1-S19.
2. Irwin CK, Kadakia A, Stoneman P, Tenuta J. Achilles' tendinitis. orthoinfo.aaos.org/topic.cfm?topic=a00147. Accessed November 25, 2013.

PERFORMING ARTS

SPECIAL INTEREST GROUP

President's Letter

I write this as my last letter as the President of the PASIG. I have enjoyed my 3 years as President and look forward to the future leadership. We are awaiting the results of the November election to determine the new President and Nominating Committee member. Thanks to all of the members who voted during this election period.

The PASIG is excited to announce our CSM 2014 programming in Las Vegas surrounding the topic of "A Multidisciplinary Approach in Caring for the Acrobatic Athlete in the Performing Arts." With the performing arts community having such a strong presence in Las Vegas, we are fortunate to have our colleagues from Cirque du Soleil in Las Vegas including Kerry Gordon, MS, ATC, CMT, CSCS, PES, who is the assistant director of performance medicine as a keynote speaker. She will speak with her colleagues Steve McCauley, ATC, CSCS; Chad Hason, MD; Tiffney Touton, PT, DPT, LAT, ATC, CSCS; and Frank Perez, ATC, on behind the scenes care of performers, epidemiology of injuries, assessments of hypermobile performers, and management of hip and shoulder pathologies. Our programming will occur on Wednesday, February 5 in the two morning sessions. Please also join us for our business meeting immediately following our programming.

We are seeking authors for content related to the performing arts specialties such as dance, music, gymnastics, and figure skating. Please review the current content on our resource center located on the PASIG webpage of the www.orthopt.org and reach out to me if you can assist with creating content.

Our Research Committee prepares a citation blast each month that consists of an annotated bibliography on a specific topic area related to the performing arts. We are always seeking authors to assist us with this process. If you are interested in contributing, please contact our Research Committee Chairperson, Annette Karim at akarim@evergreenpt.net. Please check out our current listing and summaries of these annotated bibliographies at http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes.

Thanks again for the opportunity to have served as the PASIG President, and I look forward to the future of the SIG. I will continue to be active with the group to continue our development as a SIG.

Sincerely,
Julie O'Connell, PT, DPT, OCS, ATC
President PASIG

PERFORMING ARTS CONTINUING EDUCATION, CONFERENCES, AND RESOURCES

Orthopaedic Section Independent Study Course. *20.3 Physical Therapy for the Performing Artist*.
Monographs are available for:
- Figure Skating (J. Flug, J. Schneider, E. Greenberg),
- Artistic Gymnastics (A. Hunter-Giordano, Pongetti-Angeletti, S. Voelker, TJ Manal), and
- Instrumentalist Musicians (J. Dommerholt, B. Collier).

Contact: Orthopaedic Section at: www.orthopt.org

Orthopaedic Section-American Physical Therapy Association, Performing Arts SIG
http://www.orthopt.org/content/special_interest_groups/performing_arts
Performing Arts Citations and Endnotes
http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes

ADAM Center
http://www.adamcenter.net/
Publications:
http://www.adamcenter.net/#!vstc0=publications
Conference abstracts:
http://www.adamcenter.net/#!vstc0=conferences

Dance USA
http://www.danceusa.org/
Research resources:
http://www.danceusa.org/researchresources
Professional Dancer Annual Post-Hire Health Screen:
http://www.danceusa.org/dancerhealth

Dancer Wellness Project
http://www.dancerwellnessproject.com/
Becoming an affiliate:
http://www.dancerwellnessproject.com/Information/Become-Affiliate.aspx

Harkness Center for Dance Injuries, Hospital for Joint Diseases
http://hjd.med.nyu.edu/harkness/
Continuing education:
http://hjd.med.nyu.edu/harkness/education/healthcare-professionals/continuing-education-courses-cme-and-ceu
Resource papers:
http://hjd.med.nyu.edu/harkness/dance-medicine-resources/resource-papers-and-forms
Links:
http://hjd.med.nyu.edu/harkness/dance-medicine-resources/links
Informative list of common dance injuries:
http://hjd.med.nyu.edu/harkness/patients/common-dance-injuries

IMAGING

SPECIAL INTEREST GROUP

The Imaging Special Interest Group (ISIG) is pleased to report an update on current initiatives.

Survey of Physical Therapy Education

Our project to survey imaging in physical therapist education programs is on schedule with a report planned for our business meeting at CSM 2013 in Las Vegas. We are hopeful for publication in the first half of 2014.

R13 Conference Planning

The ISIG leadership is in early stages of planning for submission to the National Institutes of Health for funding for a R13 conference on developing imaging in physical therapist practice, education, and research. We are reaching out to the American Academy of Orthopaedic Manual Physical Therapists to co-sponsor this conference.

Member Needs Survey

Please watch your e-mail inboxes for a request to participate in an ISIG member needs survey. We would greatly appreciate your help by providing input to this survey. We will use the results of this survey to plan for future ISIG initiatives.

Call for Imaging Submissions

The Imaging SIG is soliciting submissions for publication in this space. Types of submissions can include:

- Case Report: A detailed description of the management of a unique, interesting, or teaching patient case involving imaging. Case reports should include: Background, Case Description including Imaging, Outcomes, and Discussion.
- Resident's Case Problem: A report on the progress and logic associated with the use of imaging in differential diagnosis and/or patient management. Resident's Case Problem should include: Background section, Diagnosis section which details the examination and evaluation process leading to the diagnosis and the rationale for that diagnosis, including a presentation of imaging studies. Interventions section used to treat the patient's condition and the outcome of treatment; however, the focus of the resident's case problem should be on the use of Imaging in the diagnostic process and patient management. The Discussion section offers a critical analysis of how the Imaging guided the management of the patient.
- Clinical Pearl: Clinical pearls are short papers of free standing, clinically relevant information based on experience or observation. They are helpful in dealing with clinical problems for which controlled data do not exist. Clinical Pearls should describe information pertaining to Imaging which help inform clinical practice.

Submissions should be sent to: John C. Gray DPT, FAAOMPT, Publications Editor. jcgray@san.rr.com

Join Us on Twitter

Douglas M. White @Douglas_M_White
Deydre Teyhen @dteyhen
James Elliot @elliottjim

Imaging SIG Leadership

Douglas M. White, DPT, OCS, RMSK – President
dr.white@miltonortho.com
Deydre Teyhen, PT, PhD, OCS – VP
Nominating Committee
Wayne Smith, DPT, Med, ATCr, SCS, RMSK – Chair
James "Jim" Elliot, PhD, PT
Richard Souza, PT, PhD, ATC, CSCS
John C. Gray, DPT FAAOMPT – Publications Editor
Gerard Brennan, PT, PhD – Ortho Section Board Liaison

Clinical and Ultrasound Evaluation of an Acute Achilles Tendon Rupture

Theodore Croy, PhD, MPT, OCS
Lieutenant Colonel, US Army Medical Specialist Corps, US Army-Baylor University Doctoral Program in Physical Therapy, Army Medical Department Center and School, Fort Sam Houston, TX (tcroypt@gmail.com)

Shawn Stoute
First Lieutenant, US Army Medical Specialist Corps, Army Medical Department Center and School, Fort Sam Houston, TX

Tad Gerlinger, MD
Colonel, US Army Medical Corps, Department of Orthopaedics, San Antonio Military Medical Center, Fort Sam Houston, TX

The opinions or assertions in this manuscript are those of the authors and do not represent the official views of the Departments of the Army or Defense.

The patient is a 23-year-old male who sustained a left Achilles tendon injury while playing flag football. He made a hard cutting turn to the right, planting the left foot, and felt a sudden onset of pain in the posterior and distal aspect of the left leg. He was unable to continue playing.

The patient presented to the emergency room and was diagnosed with a left Achilles tendon rupture by the attending orthopaedic surgeon, placed in a CAM walker with a heel lift pad, and given crutches to ambulate nonweight bearing on the affected extremity. The patient reported to the laboratory prior to the preoperative appointment and underwent a clinical examination followed by ultrasound imaging of the posterior distal leg. The Thompson test was positive showing no plantar flexion with calf squeeze while the patient kneeled on the exam table. This was suggestive of Achilles tendon rupture.[1] Palpation

revealed a defect in the midsubstance of the Achilles tendon and the affected ankle passively dorsiflexed with gravity as the patient flexed their knees to 90° while prone (Figure 1); a finding suggestive of loss of passive resting tension of the Achilles tendon.[2]

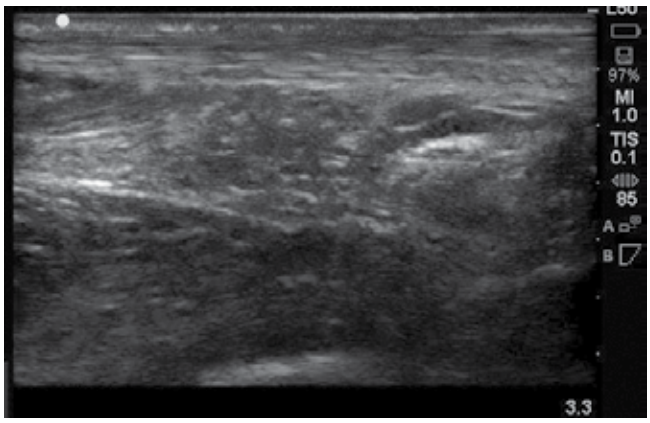


Figure 1. The patient's involved (L) ankle passively dorsiflexed with gravity with the subject in the prone position and the knees flexed to 90°. This suggests loss of passive resting tension of the Achilles tendon secondary to Achilles tendon rupture.

We performed ultrasound scanning at a depth of 33-39mm with a linear, 38 mm 10-15MHz US device (Sonosite MTurbo, Sonosite Inc., Bothell, WA) in long axis (longitudinally along fibers of the Achilles) and short axis (perpendicular to the Achilles). We identified a focal defect within the tendon and tendon retraction with dynamic movement indicating ultrasonographic characteristics of Achilles tendon rupture (Figure 2).[3] Slight plantarflexion of the ankle approximated the apparent ruptured tendon ends while slight dorsiflexion mobilized the distal segment and increased the longitudinal width of the defect without changing the appearance of the proximal segment of the tendon. Short-axis scanning of the affected area demonstrated an increased hypoechoic appearance of the area inconsistent with the normal hypoechoic appearance of the AT when viewed in this plane.

The patient underwent a surgical reconstruction of the Achilles tendon 5 days following the injury and a complete tendon rupture was confirmed intraoperatively.

REFERENCES

1. Douglas J, Kelly M, Blachut P. Clarification of the Simmonds-Thompson test for rupture of an Achilles tendon. *Can J Surg*. 2009;52:E40-41.
2. Garras DN, Raikin SM, Bhat SB, Taweel N, Karanjia H. MRI is unnecessary for diagnosing acute Achilles tendon ruptures: clinical diagnostic criteria. *Clin Orthop Related Res*. 2012;470:2268-2273.
3. Elias DA, McKinnon, E. The role of ultrasound imaging in acute rupture of the Achilles tendon. *Ultrasound*. 2011;19:70-75.

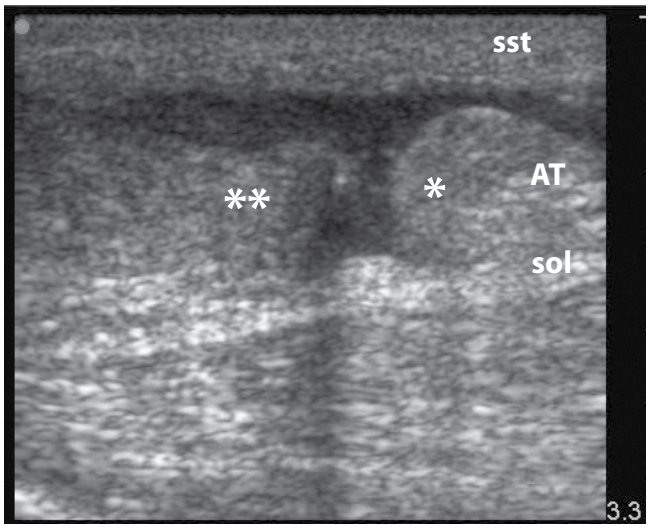


Figure 2. Longitudinal ultrasound of the involved Achilles tendon demonstrating a tendon defect, retraction and posterior acoustic shadowing (see dark area between the asterisks).
Abbreviations: AT = Achilles tendon; sol = soleus muscle; *proximal segment of Achilles tendon; **distal segment of Achilles tendon.

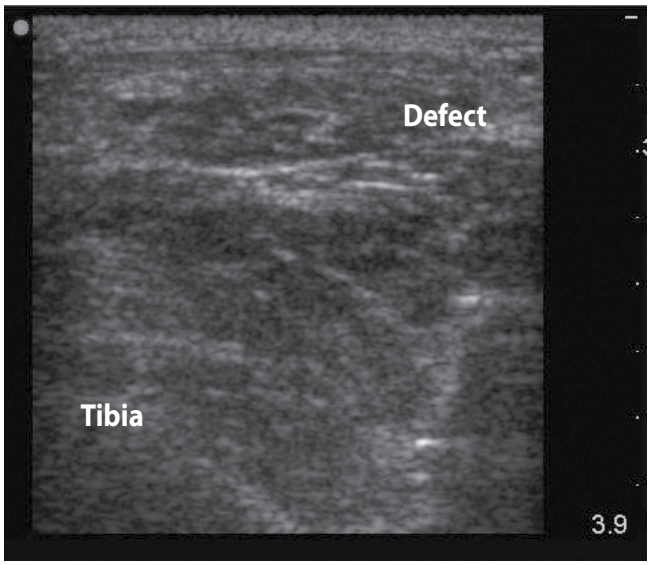


Figure 3. Cross sectional ultrasound through affected area demonstrating a hematoma (see region marked Defect).

ANIMAL REHABILITATION

SPECIAL INTEREST GROUP

President's Report

Kirk Peck, PT, PhD, CSCS, CCRT

I hope your calendars are marked to attend the 2014 APTA Combined Sections Meeting in Las Vegas, NV. The ARSIG is sponsoring an exciting educational session on treating the canine thoracic spine by Laurie Edge Hughes, BScPT, MAnimSt (Animal Physio), CAFCI, CCRT. Those of you who know Laurie also know her presentations to be cutting edge and always delivered with a flare of personal humor.

In addition to the educational forum other important issues related to the future of animal practice by physical therapists and physical therapist assistants are slated on the SIG business meeting agenda so I encourage good attendance to stimulate productive dialogue. Topics for discussion include the development of ARSIG position statements; review/revise the ARSIG Mission, Purpose, Goals; review practice analysis survey data; SIG involvement in national educational opportunities; state legislative updates; and much more.

THE PULSE OF STATE LEGISLATIVE ACTIVITIES IS INCREASING

In recent months there has been a notable increase in proposed state legislative and regulatory language addressing physical therapy and animal rehabilitation. New Jersey, Kansas, and Nebraska all have active language proposals that will be addressed in the near future. In addition, the California Veterinary Medical Board will be holding a public hearing in January, 2014 on their proposed language to implement "direct supervision" for PTs who practice on animals. To support the PTs in California, the ARSIG will provide testimony during the scheduled hearing.

The recent increase in activity to codify language in various states has prompted a reflection on some key issues for ARSIG members to consider. First, if you serve as an ARSIG State Legislative Liaison then one of your duties in that role is to inform SIG officers of any potential legislative or regulatory language being proposed in your state. Generally speaking PTs who are directly involved in animal rehab are the first to learn about proposed language in respective states and thus serve a vitally important function. Think about it as being part of an "early alert" team to support the mission of the ARSIG, and ultimately the scope of animal practice for PTs and PTAs in all states.

As a nationally recognized organized body representing PTs and PTAs who treat animals, the ARSIG serves as a valuable resource for members who seek guidance in political negotiations, language review, and even testimonial support. In fact it is one of the SIG's primary goals as an organization to be involved in the political arena as appropriate. However, unless SIG officers become aware of such issues occurring in your state we can be of little help in the process. Not only does the ARSIG stand in support of animal rehab by PTs and PTAs but so does the Orthopaedic Section, and APTA in general through a House of Delegate position statement. So please recognize these valuable resources and what they can offer by way of navigating often very murky waters when dealing with political entities.

THE ART OF POLITICAL COLLABORATION

Political debate and the power of negotiation and persuasion are probably some of the most difficult skills to acquire, and unfortunately the majority of physical therapists were not taught these skills during entry-level education. However, as stated in previous communications, PTs and PTAs practice "by law" so if we as practitioners desire to utilize the full extent of our education then we have no choice but to become politically involved at some level. In the case of negotiating legal rights to practice on animals, the rules of the game are still very rudimentary in comparison to the years of experience our profession has obtained negotiating language to treat humans. This fact alone is justification enough for the importance of the ARSIG and its role as a national entity to support a greater universal good versus just individual needs.

Some of you might be asking, ***"What does he mean by a greater universal good?"*** Funny you should ask. The Animal Rehabilitation SIG is an entity that was organized to serve the greater collective vs. focusing on just isolated desires or personal battles within states. If, however, certain state issues have political ramifications that could impact therapists in other states, then the ARSIG will take appropriate action. In practical terms this means I have just as much personal concern for the ability of PTs and PTAs to practice without burdensome stipulations in California as I do for therapists throughout the country. The California proposal in other words has national implications.

As a practicing PT I certainly have great concern over laws in my state impacting me on a personal level, but as President of the ARSIG, I must carry an added perspective. As an elected officer I have a duty and obligation to serve ALL SIG members in all states and to support a more unified mission to encourage and advance the practice of animal rehabilitation in such a way that maximizes the full potential and skills offered by PTs and PTAs. To fulfill this mission is to strive for greater continuity in legislative language that allows therapists to develop professional and collegial relationships with veterinarians and clients with some level of consistency across state borders. Yes, it would be wonderful if all states could share exactly the same legislative language and have it couched in all PT Practice Acts. However, that vision is an unrealistic dream filled with improbabilities. The reality is that language is currently being proposed from both sides of PT and Veterinary regulatory bodies, thus creating a great deal of confusion and inconsistency.

If there is a significant lack of continuity in the ability for PTs and PTAs to practice on animals in various states then a universal, or at least national, ability to provide quality care for animals will be fragmented and even chaotic to some degree; eg, your ability to practice on animals will vary greatly from state to state. The message I am trying to convey was best echoed by Blair Packard, PT, during his term as President of the Federation of State Boards in 2003. In an article published in

OPTP (2003) entitled, *"Collaborative Practice Related to Treatment of Animals,"* Packard outlined the philosophy and need for collaborative language among the Regulatory Associations/ Federations representing the Veterinary, Physical Therapy, and Chiropractic professions. In reference to forming a collaborative position statement on the relationship between veterinarians and non-veterinarians Packard stated,

> ***"Its genesis [eg, position statement] began with the simple premise that the therapeutic treatment and rehabilitation of animals is evolving to include non-veterinarians, that the statutory and regulatory landscape is rather barren relative to this evolving practice, and that unless these three regulatory groups take some leadership in addressing this issue, what will inevitably develop will be a rather messy pattern of practice and regulation probably established through costly legislative and regulatory 'turf fights' and legal battles over many years." (pp. 59)***

Packard's insight into what frequently occurs in political venues without strong leadership is absolute truth…if leaders in the professions themselves fail to take action, someone else will. Unfortunately that often entails individuals who have no vested interest in the scope of practice in question, and a significant lack of understanding of the educational qualifications required to carry-out new and evolving health care services. In other words, the people who make the laws governing health care scope of practice are NOT the ones providing the actual care to patients and clients. I hope this commentary illustrates the inherent problem I am trying to express and explains why it is vital for all of us to get involved in the process, and why the ARSIG is so important in serving as a national voice.

ARSIG SUBMISSION REQUEST

On a final note I respectfully ask all ARSIG members to please consider submitting one of the following items related to animal rehab for potential publication in a future edition of OPTP: an interesting case study, clinical research outcomes, literature review on a topic of choice, new book review, or even an update on current rehab techniques such as applied physical agents, manual therapy, therapeutic exercise, orthotics and bracing, etc. OPTP is an excellent forum for ARSIG education as a benefit of Section membership, and to also educate non-SIG members who also consume the publication.

NEW YEAR'S RESOLUTION

For your personal growth and benefit, make it habit in 2014 to read at least one new article related to animal rehab per month from any reputable source. Not only will you find the exercise enlightening, but it will also stimulate new ways of thinking and creativity as a rehab therapist.

Happy Holidays!

REFERENCE

1. Packard B. Collaborative practice related to treatment of animals. *Orthopaedic Physical Therapy Practice.* 2003;15(3).

Contact: Kirk Peck (President ARSIG): (402) 280-5633 Office; Email: kpeck@creighton.edu

EDUCATIONAL CORNER

Lisa Bedenbaugh, PT, CCRP

There have been two recent textbook additions to the canine rehabilitation field. *Canine Sports Medicine and Rehabilitation*, edited by M. Christine Zink and Janet B. VanDyke is one of the offerings. This text covers a wide range of topics relating to canine sports medicine and the rehabilitation of orthopaedic injuries. Topics include exercise physiology, nutrition, conformation and its relation to gait and function, therapeutic exercise, modalities, assistive devices and common orthopaedic issues and rehabilitation goals for those issues. The book contains contributions from DVMs, PTs, OTs, and an orthotist/ prosthetist.

The book uses evidence-based medicine, citing references of studies where there is scientific evidence to support the information provided. In those cases where there is no scientific evidence to support the author's claim, it is noted as such. Several of the chapters also contain case studies relating to the topic being discussed. These case studies include evaluation findings, a problem list, assessment, goals, and treatments.

The therapeutic exercise chapter provides several useful "pearls," such as focusing on correct posture/form with the exercises and not allowing the dog to "cheat;" keeping the dogs under control to maintain safety, use of assistive devices, and when to progress the program.

The chapters on common orthopaedic problems seen include muscle strains, tendinopathies, ligament pathologies and joint issues, such as hip dysplasia. Following the chapters

(Continued on page 76)

Index to Advertisers

ANIMAL REHABILITATION

(Continued from page 75)

identifying the problems, the book discusses possible treatment options. These options are organized by the tissue type (ie, muscle, ligament), and the type and acuity of the problem. The book concludes with chapters on diagnostic imaging, emergency medical considerations, and chiropractic. I found this text to have much interesting information on several different topics related to rehabilitation of orthopaedic and sports-related injuries.

Other textbooks relating to canine rehabilitation include: *Canine Rehabilitation and Physical Therapy, 2nd ed.*, edited by Darryl Millis and David Levine, and *Animal Physiotherapy: Assessment, Treatment, and Rehabilitation of Animals*, edited by Catherine McGowan, Leslie Goff and Narelle Stubbs.

UPCOMING EDUCATIONAL OFFERINGS:

--"Assessment of the Animal Rehabilitation Patient" is a 3-monograph independent study course published by the Orthopaedic Section. It contains information on evaluation of canine and equine patients, and zoonoses/red flags. It should be available for purchase in early 2014, and can be found through the Orthopaedic Section web site, www.orthopt.org

--The 4th annual "Symposium on Therapeutic Advances in Animal Rehabilitation," sponsored by Thera-Paws, is April 23-27th in Florham Park, NJ. This year, they are offering a preconference course, hands-on labs and a lecture track by AARV. For more information, go to www.staarconference.com

--The 8th "International Symposium on Veterinary Rehabilitation, Physical Therapy and Sports Medicine" is August 4-8th, in Corvallis, OR. There will be presenters from multiple countries discussing topics relating to canine and equine rehabilitation. For more information, go to www.iavrpt.org.

Orthopaedic Physical Therapy Practice
Orthopaedic Section, APTA, Inc.
2920 East Avenue South, Suite 200
La Crosse, WI 54601